THE LEADING UK CONSUMER ELECTRONICS TECHNOLOGY MAGAZINE

TELEVISION

SERVICING·VIDEO·SATELLITE·DEVELOPMENTS

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PROJECT: Off-air test signal source

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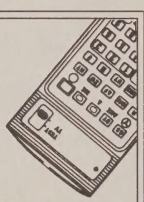

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Innovation

There has never been a time during which as much development work and innovation has been going on in the TV, video and related fields as at present. There are reports of something new almost daily. Much of this has been made possible by digital technology. It's a matter of interfacing one item with another to get interactive and other services (not as easy as it might sound). Boxes speaking to boxes like. PCs are linked to cable TV, or TV sets to the internet. TV sets are becoming more sophisticated, with progressive scanning capability for example, so there's no longer the restriction of a poor display when the TV screen is used in a "PC mode". Or maybe you would prefer to do it all through your games console: Sega and others are developing new consoles that provide a bridge between cable TV and the internet.

It's difficult at this point to see how things will pan out. The consumer has yet to have his say, because the technology is racing ahead of what can be offered at present in terms of practical services. It's all very well to demonstrate that something is possible: will it be wanted? After all it has to be user-friendly. You might for example be able to call something up on the TV screen by simple operation of a remote-control unit, or do something similar but with much greater wider options using a PC and a rather more complex operating procedure. What will Joe Public prefer? We don't know, and the problem is compounded by the fact that users differ considerably: some will be prepared to devote more time than others to exploring operational possibilities.

Do you make full use of your PC? I certainly don't. Like many others I suspect, I use a few simple routines that enable me to carry out the jobs I need to do. I haven't the time – or, to be honest, the inclination – to sit down and explore the capabilities of the available software. This is a problem to which broadcasters/webcasters are going to have to find answers. If you are offering a service to the general public rather than say computer experts, it has to be simple to use.

That will be sorted out in time. But meanwhile the technology progresses regardless. There's a thing called internet 2 for example. It would provide full-motion, high-definition TV. All it needs are suitable distribution links and modems. It could clearly have a major impact on interactive video services. But I suspect that the investment required would be enormous. It might start as some sort of professional service. Then again, things that start in this way can soon become mass-market products as production costs fall – and Moore's Law tells us that they must!

Digital cable of one sort or another appears to hold out the best prospects for the development of the information age. But what most of us are concerned with is nice, convenient hardware. Development here is also progressing rapidly, with all manner of new products beginning to appear or in the pipeline. How for example is information to be stored? The DVD, versatile indeed as its potential is developed, is catching on rapidly. Meanwhile there is much research going on into the use of hard-disk technology for consumer applications. Might this supersede the DVD? We will probably need both, the hard disc for cable supplied information storage and retrieval, the DVD as an inexpensive way of providing software.

What this means in terms of practical hardware is all sorts of multimedia devices. They are already coming along. Pioneer has just launched the first DVD recorder, while Hitachi has a combi DVD-audio CD recorder unit and Samsung a DVD/3D games player with full interactive capability. Such equipment could obviously be given internet capability. There is, in fact, incredible scope for product development. The pity is that so little is being undertaken in the UK, because of the loss of our indigenous consumer electronics industry. There is of course Pace, with its digital boxes – the company keeps on coming up with something new – and our cable operators and broadcasters are keeping ahead of the pack. But, as for so many years now, for basic consumer electronics hardware you have to look to the far eastern manufacturers, Japanese and, increasingly, Korean.

What will we be actually watching? – or listening to for that matter, what with digital speakers and the like. Display technology is also advancing rapidly. Hitachi's new widescreen rear-projection CRT system has been made possible by 'magnetic intelligent convergence', which takes ninety seconds to set up automatically using eight sensors to check an internally-generated test pattern. For something quite different, Samsung has come up with a set that uses a ferro-electric liquid-crystal panel to provide a high-definition TV display (it's for the US market). Such technology is not cheap, but does highlight the almost limitless prospects that are opening up.

Consumer electronics is poised for an incredible future. But most of us will probably continue with a couple of cheapo units coupled, now, to a digital service of one sort or another via a simple STB.

Correction

The final line on page 206 in last month's issue failed to appear because of a glitch between the editorial and printing computers. It read "a transistor, but that's another story".

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But the subject doesn't stand still. New models, new faults - there is always something to add. So here we have the fifth edition, which has been completely updated and now has 300 pages and a more attractive cover. In addition to receiver fault notes and general information you'll find many useful button sequences for resetting parental lock codes, resetting installation choices to factory defaults and other less well known operations, practical information on LNB's with typical current drains, a list of manufacturers and suppliers addresses, other useful information and a beginners section. Digital receivers are now available so the manual includes a chapter to deal with these too."

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KIT3 £6.95 Amstrad - SR510,520,540,SRDR45,SRD550
KIT6 £6.95 Pace D100,120
KIT9 £9.45 Pace MSS200,300,**Apollo**
KIT12 £16.45 Echostar SR5500(early PSU with adjuster)
KIT15 £7.36 Mimtec (Sorenson PSU type only)
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KIT22 £9.95 Philips STU909

KIT4 £6.95 Amstrad SRD 500
KIT7 £6.95 Churchill D2MAC decoder
KIT10 £13.11 Pace MSS500,1000
KIT13 £39.71 Echostar SR6500,7700,8700
KIT16 £5.95 Amstrad SRD700,SR950,SRX100,301,501,1002,2001,SRD2000,SAT250
KIT 18 £10.53 Amstrad SRD2000
KIT23 £7.95 Nokia SAT1700 (mainly surface mount)

KIT5 £6.95 Amstrad SRX320,340 etc (export models)
KIT8 £5.95 Pace MSS100
KIT11 £5.95 Ferguson SRD4
KIT14 £23.95 Amstrad SRD600
KIT 19 £6.95 Bush IRD155
KIT21 £6.95 Amstrad SRD650
KIT25 £16.95 Maspro ST-8

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What a Life!

Where on earth did this strange crowd come from? Is it some sort of clinic or a telly repair shop that Don runs? Donald Bullock's servicing commentary

The other morning I decided to go fishing before work. So I made myself a flask of hot soup and another of hot coffee, wrapped up well and arrived at the pool just before dawn. It was still and cold, and a mist rolled gently over the surface of the pool. I tackled up, fixed my bait and swung it gently. But instead of hearing it plop in, there was a scuffling noise. I looked towards my floats and saw that they were resting on ice. I should have stayed in bed.

My glasses were misting up. When I took them off to wipe them they fell to the ground. As I bent forward to retrieve them my flask of soup fell from the basket on to my shin. I bawled out then heard the crunch of glass.

I was beginning to feel nasty, so I decided stop an calm down.

Someone came threshing through the reeds. It was Walter Wainright, one of our customers, with his spinning rod. He recognised me and smiled.

"Fancy seeing you here Don. Lovely day, ennit? Makes you feel good to be alive. Actually I have my set in the car. Ticking. Caught any?"

I beckoned him over and said a Very Rude Thing into his ear. He jumped up and strode off.

That was enough. Time to get back. When I arrived at the shop Steven and Paul saw the fishing tackle.

"Catch anything?" Steven asked.

I shook my head.

"Well, I expect you enjoyed yourself, anyhow" he continued.

I said something that wasn't very polite. They both breathed in deeply and got on with their work. As I was making a cup of tea Walter Wainright came in carrying his TV set.

A Ticking Philips TV

"Hope you've got over whatever was bothering you, Donald" he said, then tapped his set. It was a Philips Model 21ST1730/25B – the GR2.1 chassis.

"Dead" he said, "no life at all. No, I tell a lie. It's ticking. I tell a lie."

When he'd departed I removed the back and checked the HT voltage. It was pulsing between 30-60V. So I disconnected the feed to the line output stage, by pulling out the plug for the line scan coils, and connected a 100W bulb as a load instead. The set continued to tick. It was clearly a power supply fault.

I made some checks in the chopper control circuit and found that C2611 (68µF, 25V) produced a high ESR reading. A replacement cured the fault. When I checked its capacitance it was only slightly low at 61µF. It was the resistance that had caused the problem.

Video/TV Combi

Shortly afterwards William Cramshaw called in with a Matsui TV/VCR combi unit. I don't like these combination models one bit.

"What's up with it?" I asked.

He scratched his brow. "Let me see now, just a moment, let me see . . ."

There didn't seem much point in carrying on with the interrogation. "One for you, eh?" I said to Paul.

"Not me, Steven does tellys."

I turned to Steven. "You can do this one, can you?" I asked.

"No, Paul does videos" he said.

As I was getting nowhere I decided to make a start on it myself. I switched it on and found that it was dead. The 2·2Ω surge-limiter resistor R501 was open-circuit and the 2SK2056 chopper transistor short-circuit. I replaced them and switched on again. The unit flickered to life for a second then died. Steven noticed.

"You should have checked R508 – the 47kΩ, 3W resistor there by those two capacitors" he said. It was open-circuit. I replaced it and also the two items that had blown up again. This time nothing at all happened when I switched on.

"Did you replace the TDA4605 chopper control chip?" Steven asked, "it often fails with this fault."

When I did as I was told the unit sprang to life.

A Monster TV

As I was boxing up the combi unit the door of the shop flew open and a monster TV set with legs staggered in.

"I'm Faggot, Ernie Faggot" it croaked. As it settled on the counter a tiny man appeared from behind it.

"Can't tell you how little it is" he said. "See what I mean?"

"How little what is?" I asked.

He tapped the set. "This 'un. See what I mean?"

I looked at the set, which seemed very big to me, then at him.

"Joo know, 'e ain't this big" he said, holding his thumb and finger slightly apart. "See what I mean?"

"Do you mean the picture is not very high?" I asked.

"Course I do!" he replied, holding up his hand again. "Little as this! See what I mean?"

As he pranced off Steven removed the set's back and went straight to the field output chip.

The set was a 28in. Baird Model RR6890N.

"'Struth, I've never seen dry-joints like these" he exclaimed. He spent ten minutes resoldering them then switched the set on. There was full field scan, then it collapsed. As there didn't seem to be anything else amiss he replaced the chip, a TDA8172 (IC401). This time the field scan came up and stayed up.

Fed up with it

Mrs Bison is a large lady. She was wearing a fur coat and smoking a pipe. Steven raised a polite smile as he wove about through the haze.

"I've brought my what's-it" she announced, "you know, my thingumajig."

Steven's mouth moved a bit, but words escaped him.

"Right fed up with it I am" she continued. "All right to look at, but a pain in the neck. It's in the car out there."

Steven and Paul went out and returned with a 28in. Philips set, Model 28SL5770/05B. It was certainly an attractive set, with its polished teak-effect cabinet.

"Goes into standby just when 'e wants to" she explained, "sometimes six times a night. Then 'e'll work all right for a month. Last night 'e went off when Max Bygraves came on. Course I didn't mind that."

"Course not" I interrupted.

Paul had a go at this one. He tapped about the chassis endlessly and finally found that he could trigger the fault by very lightly tapping around in the line output stage area with a plastic trimming tool. Shortly afterwards he localised the cause of the trouble to the line driver transformer. One of its pins was dry-jointed. He had to use our giant magnifier lens to see this.

Takes 'is time

"Don't get me wrong" Albert Featherpenny said as he bowled in with a Toshiba colour set. "I ain't saying 'e don't work like. All I'm sayin' is that 'e takes 'is time. We often 'as to switch him on two hours before a programme. And sometimes 'he takes all of three hours. But don't get me wrong. He allus do come on."

Featherpenny's set was a Toshiba 219T9B. Paul removed the back and checked around in the power supply section. As he couldn't find any poor joints or loose connections he decided to replace the electrolytics on the primary side of the main chopper circuit, in the control section. There are three, the drive coupler C814 (100µF, 50V) and two LT reservoir capacitors, C818 (22µF, 100V) and C823 (10µF, 16V). Once replacements had been fitted the set fired up without any problems at all. It joined the awaiting-collection pile.

Only so much

Our next caller was a large, bullet-headed man. He didn't seem to be exactly sensitive. "Grype's the name" he hollered, "and I'm calling in about 'er." He jerked his thumb at his wife. "Sits in the dark for hours every night with a silly look on her face. I mean, a man can take only so much. A man can take only so much."

Mrs Grype blinked. Steven didn't know what to do. He coughed and scratched the back of his neck. Paul decided to look for something under the counter. I clattered about in the scullery. When I returned Steven was doing his best.

"Er . . . I . . . what . . ." he muttered. Then his face brightened. "We repair television sets here Mr Grype."

"I know" said Grype. "I want you to get ours to work. After all, a man can take only so much . . ."

The set was a 24in. Sony KVX24WS1U (BE3B chassis). It seems that Mrs Grype had been watching an extremely dark picture for several weeks before the set died. We found that the causes of the two faults were not related.

The set was dead because R600 in the start-up circuit on the primary side of the power supply had failed. When this resistor was replaced the set came on but its picture was so dark it was unwatchable, even in a dull light. Checks on the various supplies showed that the 12V line was very low at only 3V. The cause of the trouble was a faulty MC7812 regulator, IC605. Once a replacement had been fitted the set presented us with a picture of exceptional quality.

Collections

By now the shop floor was littered with repaired sets and Paul was having trouble stepping around them. Fortunately Walter Wainright put in an appearance.

"'Ello, 'ello Donald old fruit" he said, "still playing the prat are we, or have you settled down now? You weren't in too good humour this morning. No – I tell a lie, I tell a lie. You were downright nasty!"

As Walter was paying up William Cramshaw came in, followed by Ernie Faggot.

Mr Featherpenny drew himself up to his full four foot eleven.

"Let me see now, let me see" said Cramshaw, "I've called for my set. Let me see, where is it?"

"I've called for mine too" said Faggot, "see what I mean? I hope it's ready. Only we've got visitors tonight. See what I mean?"

As Paul was dealing with these customers Mrs Bison stumped in, followed by Albert Featherpenny and the Grypes.

"Right" said Mrs Bison as she tapped her pipe out on Featherpenny's set, "where's my bloody what's-it? You know, my thingumajig?" She turned to Albert, "have you seen it, my thingumajig?"

Mr Featherpenny drew himself up to his full four foot eleven. "I certainly haven't, and I've no wish to!" Then, as Mrs Bison gave him a withering look, "mind" he said, "don't get me wrong."

"Mr Bullring" said Grype, "if I could just have my set. It seems to be a bit of a madhouse here. How did you get all these nutters together?"

I shone my nails on my lapel. "Influence" I said.

"My set please, Mr Bullring" continued Grype, "a man can take only so much."

Well, at least we'd had a busy time and made a few pounds.

TELETOPICS

Record year for TV and Video sales

The latest figures from BREMA show that 1999 was a record year for the TV/video trade, and there are signs that the boom conditions will continue throughout 2000. CTV sales in particular were good. Deliveries to the trade were over 5·5m, of which 2·7m were small-screen and 2·8m large-screen sets. This was a record for large-screen sets and, particularly noteworthy, widescreen set deliveries more than doubled to some 852,000, an increase of more than 560,000. BREMA's director, Hugh Peltor, feels that this probably reflects the success of digital pay-TV, with 'free' set-top boxes. Mr Peltor expects sales of IDTV sets to increase tenfold this year.

VCR deliveries were a record 3·85m, but perhaps more significantly DVD has proved to be a success with deliveries of 235,000 players. DVD software sales passed the 4m mark by the end of the year, with disc sales over 1·4m in December alone (British Video Association figures). DVD is catching on at a faster rate than either VHS or the CD. Camcorder deliveries rose to 562,000 in 1999, still below the peak (580,000) reached in 1992. The camcorder figures include 155,000 Digital Video models.

Dixons has reported record trading, with turnover for the 28 weeks to November 13th up from £1·45bn to £1·72bn. The operating profit rose from £54·6m to £62·9m. But Dixons has announced a profits downgrade for 2000 because of falling high-street prices. This applies particularly with mobile phones and computer games. Phones that sold for £70 at Christmas 1998 were selling for £40 last Christmas. Colour portables have fallen in price from about £120 to the £70 mark. Comet has also issued a warning about pressure on margins.

Pioneer launches first DVD recorder

Pioneer has launched, in Japan, the first domestic DVD recorder, Model DVR1000. It uses the DVD-RW format which, with DVD-RAM, is part of the official DVD standard for recording. Up to six hours of video can be recorded on a 4·7Gbyte disc, with picture quality decreasing as the storage time increases. The discs can be used and reused some 1,000 times. Edit and shift features are available, including erase, combine, divide, move and playback of specific scenes. The Video Recording Format (VRF) version 1.0 standard used is not compatible with existing DVD-Video players however – they cannot read the format's complex table of contents. But future Pioneer DVD recorders will also be able to record in a video mode that is compatible with DVD-Video equipment.

The recorder has Dolby Digital sound and conforms to various copy-protection systems, so users cannot copy prerecorded DVD titles. Other features include a Disc Navi system that provides an on-screen index of recordings, component video output sockets, a DTS audio stream, four-step fast forward/reverse, slow-motion, a commercial-skip function and timer recording. The DVR1000 costs the Japanese equivalent of about £1,300, the discs costing some £17 each. Pioneer plans to launch DVD recorders in Europe early next year.

Video products

Hitachi has launched the first combined DVD-Video player/audio-CD recorder, Model DVW1E. CDs can be copied at double speed and there are analogue and digital inputs. Features include Hitachi's Disc Navigation system, digital noise reduction, a 2x/4x zoom, a built-in Dolby Digital 5.1 decoder and DTS compatibility. The Hitachi Illumina TV range is the world's first to use CRTs for rear projection with a widescreen display. There is also a digitally-generated progressive-scan option that's claimed to provide better detail and increased display stability. There are two models, the 55in. C55WP910TN and 43in. C43WP910TN.

The Sharp VLSD20H mini camcorder.

Sharp has launched what is claimed to be the world's smallest DVD player, Model DVL70S. Features include a 7in. LCD screen, Digital Super Picture which Sharp says provides sharper pictures by adjusting the brightness and contrast, Virtual Dolby Surround, Dolby Digital, MPEG-2 and DTS audio outputs. A playing time of up to three and a half hours is possible with a lithium-ion battery. Sharp has also introduced a new palm-sized mini camcorder, Model VLSD20H, that weighs just 560g. Features include an f1.8 lens, a 770,000 pixel CCD imager, an optical zoom (10x) and digital magnification to 100x.

Samsung launched the Extiva 'all-in-one' entertainment station at the Las Vegas WCES. It includes a DVD player, 3D games player and interactive functions. 'Visual music' and 'infinite motion zoom' are amongst the advanced features incorporated. It is expected to sell at about $500 in the USA. Sale in Korea and Europe is scheduled to begin in the second half of the year. Samsung has launched a free-to-air digital terrestrial receiver, Model WS32W6DT, in the UK. It incorporates an interface socket to enable an industry-standard CA module to be added for subscription TV. Features include a 32in. widescreen CRT, 100Hz scanning, Virtual Dolby Surround sound and compatibility with the ITV/BBC MHEG-5 digital text services. Users can upgrade to full Dolby Pro-Logic sound by adding extra speakers.

Business/trade news

Thomson Multimedia UK (Ferguson) has moved from its traditional Enfield location to West Malling, Kent. The service, spares and all other departments have relocated to the new offices at 30 Tower View, Kings Hill, West Malling, Kent ME19 4NQ. Phone no. is 01732 520 920, fax 01732 520 901.

Test and measurement equipment specialist Vann Draper Electronics Ltd. has moved to new, larger premises in a Grade II listed building just south of Derby. The new address is Vann Draper Electronics Ltd., Stenson House, Stenson, Derby DE73 1HL. Phone 01283 704 706, fax 01283 704 707, e-mail sales@vanndraper.co.uk

Onwa Electronics (UK), which has been assembling TV sets at the Simon Side Industrial Park, South Shields since 1993, has gone into receivership. Grant Thornton, joint administrative receiver, reports that several companies have expressed an interest in acquiring the business.

Willow Vale Electronics Ltd. has released an updated CD-ROM catalogue, issue 7, that includes 20,000 new products. For further information phone 0118 986 0158.

U-View has made *Television Servicing Five* available in CD-ROM form at £79. The CD-ROM version offers a zoom facility (magnification up to 1,600 per cent on circuit diagrams), extra information, index hyperlinks and circuit diagram navigation. Work is progressing on Book Six and other developments. For further information contact U-View Technical Publishers, Unit 3F, Plumtree Farm Industrial Estate, Bircotes, Doncaster, Yorkshire DN11 8EW. Phone 01302 719 997, fax 01302 719 995.

A number of new/updated publications are available from ECS. There's the third edition of the *Equivalents Guide Book* at £6.95. This updated work contains 7,500 entries including a TV model to chassis listing and TV, VCR, camcorder, satellite and monitor equivalents guides. Edition 23 of the *Fault Index Books* at £14.75 lists over 14,000 TV, VCR, video, satellite, camcorder and monitor faults based on reports in *Television*. The company also provides databases in floppy disk form. *Fault Indexes on Disk* version 1.9 is priced at £17.50: it indexes 22,500 TV, VCR, camcorder, satellite, CD and monitor faults that have appeared during the last twenty years in *Television*. *Kwik Tips on Disk* version 1.1 at £22.95 contains edited TV and VCR fault reports – 20,000 entries covering 1,435 chassis and models. For further details contact ECS (Technical Publishing), 316 Upton Road, Noctorum, Wirral, Merseyside L43 9RW. Phone/fax 0151 522 0053.

BS Manufacturing's latest cordless soldering iron, Model P100, provides precision heating power (up to 120W) despite being a tiny (19cm long), pen-style tool that weighs just 57g. It costs about £18 (IR£22) and can be purchased on-line at www.vulkangt.com or from distributors.

The P100 uses catalytic conversion for most of its applications, delivering heat to the tip via infra-red radiation. The fuel, stored in the translucent handle, is liquid butane/propane gas. A squirt from a gas canister refills the tank, each refill providing about 45 minutes of continuous use at a typical setting. Gas-flow regulation, by means of a slider, provides fine adjustment down to 20W. There's a wide range of attachments. For further details contact BS Manufacturing Ltd., Strawhall Industrial Estate, Carlow, Ireland. Phone +353 (0)503 41340, fax +353 (0)503 40363, or e-mail sales@vulkangt.com

ONdigital

ONdigital subscription sales reached 552,000 at the end of 1999, a 34 per cent increase since September. The total includes 15,000 users who have signed contracts but have still to activate their cards and 10,000 STBs installed without subscriptions (dealers, staff etc.). ONdigital expects to pass the million mark during 2000, half way to its break-even point. Investment to date has been £211m. Pre-paid boxes accounted for 50 per cent of sales during December – customers pay £119 for an STB and a one-year subscription to six channels.

Field trials of the company's e-mail service, ONmail, are now in progress: the service is expected to be launched during the first half of the year. Viewers will be able to buy a wireless keyboard and send/receive messages via their TV sets for the price of a local call. Internet access is also to be provided, but will probably not arrive until second-generation boxes with faster modems are available.

ONdigital and SDN (S4C Digital Networks) have signed an agreement to provide a pay-per-view service, ONrequest, which will offer up to five channels of movies and other events via SDN's multiplex A. The service is expected to start this spring and will be available to both ONdigital subscribers and free-to-air TV viewers. A subscription module that plugs into an IDTV set is promised for May. It will be free to subscribers.

News from SEME

Finding a high-quality replacement TV or monitor LOPT quickly is vital for many repairs to be cost-effective. As a very helpful aid SEME is offering free, to trade customers only, the very latest HR Diemen LOPT cross-reference catalogue, edition 9. It lists thousands of LOPTs for hundreds of brands and also provides cross-references to chopper transformers, triplers and coils. HR Diemen manufactures LOPTs that are supplied to many setmakers, a guarantee of first-class quality. Phone the SEME sales hotline on 01664 484 000 for your copy of the catalogue.

For the second year in succession SEME will be attending the ER Show, which is being held at the NEC, Birmingham during March 26-28th. The company will be demonstrating its new SALI CD-ROM active-link catalogue. This user-friendly CD catalogue lists more than 750,000 products, many with pictures and some with exploded-view diagrams. SEME's new ProVision 8 modular CCTV surveillance system, which is suitable for homes and small businesses, will also be demonstrated. You will find SEME at Stand 30 in Hall 12, where you will have the opportunity of entering a prize draw.

Satellite TV

Nearly half of SkyDigital's subscribers have used the Open interactive TV service at least once a week since it started in October. Over a million visits were made during the pre-Christmas period, when sales exceeded £1m a week and almost 128,000 orders were processed. More than 350,000 viewers have registered for Open's free e-mail service.

Eutelsat has launched a new free-to-air digital multiplex via its W3 satellite at 7°E. Called "The Best of Eutelsat", the new service is currently broadcasting Euronews, Fashion TV, RAI Uno, RTP International, TV5, ZDF and two RFI radio channels at 11·387GHz H. Eutelsat has ordered a new satellite which is expected to go into service as Atlantic Bird 2 at 8°W in mid-2001.

Satellite Notebook

Reports from Christopher Holland Hugh Cocks and Michael Maurice

The SkyDigital NPTV viewing card

Mr Miller lives in an area where the terrestrial TV signals are very poor. Now that digital TV is here, he wanted better reception. But there are no digital terrestrial TV signals in his area, and he didn't want to subscribe to SkyDigital. There's a solution to the problem: you can use a Sky digibox with the little-known NPTV (non-pay TV) viewing card. It provides reception of the terrestrial UK channels (and more) with the exception of the ITV channels – to prevent unauthorised reception outside the UK, these are not available as free-to-air satellite channels. The cost of the card is covered by the licence fee.

You don't have to sign a viewing contract to obtain a card, but a digibox must have been installed – the interactive Open TV contract subsidises the cost of the decoder provided there's a telephone line connection to it, and can be taken up if required. Once the installation has been carried out, you call the NPTV viewing number 0870 243 8000 and give the customer's address details and the serial number of the digibox. The latter is available from the 'system details' sub-menu, after entering the 'system set-up' menu. Occasionally the digibox version number is required as well. It can also be found in the system details menu. An NPTV viewing card, which has to be activated, will arrive within a few days. The card is of similar appearance to the standard SkyDigital card – the service is administered by Sky on behalf of the UK FTA channels.

Activation can be carried out via the installation menu, with the digibox calling Sky, or the NPTV viewing number can be rung and the card activated over the phone. During this procedure the receiver has to be left tuned to ch.109, UK Gold. Prior to activation, on-screen message number four, "this card is not authorised, call your broadcaster for assistance", appears. This is a bit confusing, because UK Gold is not part of the NPTV package. Once the card has been activated message 04 disappears. Instead, "press select for subscription upgrade" appears at the bottom of the screen. You get the same message with a standard Sky card on channels that don't form part of the subscription package.

Once this message is seen the NPTV channels can be viewed. They have the same EPG (electronic programme guide) numbers as with a standard Sky viewing card. BBC1 (ch. 101) is usually quite slow to produce a picture after card activation. BBC2, Ch. 4 and Ch. 5 are often there, but selecting ch. 101 produces only a stern message saying "this channel is not available". The solution is to leave the digibox switched to ch. 101 overnight (the subscriber call centre advice is to leave it on ch. 101 for up to six hours). By the following morning BBC1 should have appeared. Once this has happened, selecting ch. 101 on any subsequent occasion will produce BBC1. Why the initial delay? Apparently it's because BBC1 is regionalised and the card has to obtain authorisation for the correct area – this depends on the post code number.

The channels available with an NPTV card are shown in the accompanying table. Channels that are encrypted require the card to be inserted. The various shopping and some other channels between EPG numbers 650-700 are also available. Radio stations between EPG numbers 911-935 are available, with the exception of Talk Radio (918) which requires a minimum Sky viewing subscription (£6.99 per month). **C.H.**

Channels available with the NPTV card.

EPG no.	*Channel*
101	BBC1
102	BBC2
104	Ch. 4
105	Ch. 5
160	BBC Choice
181	Travel
327	TCM
501	Sky News
507	BBC News 24
508	Parliament
513	CNN
553	BBC Knowledge
691	God channel
694	Inspiration

Pace MSS100

This receiver lives at the top of a cupboard for several months a year while its owner is away. When being extracted from its hibernation recently it fell about a metre on to a hard floor. The bottom front of the cabinet was cracked, and some rattling noises were heard from inside. Fortunately the owner hadn't tried to switch the receiver on in this condition. There was no obvious damage to the PCB, and the rattling noises were produced by some pieces of black plastic from the lower section of the case.

As the receiver was an early one (the date coding on the bottom indicated 1995) I replaced the large electrolytic capacitors in the power supply and removed the piece of

screening foil from the inside bottom of the case – in the past I've had intermittent faults that were caused by component legs puncturing this insulation layer.

When the receiver was powered the mains bridge rectifier's 47µF reservoir capacitor charged up but that was all. A detailed examination of the PCB revealed that the link between D18 and the 7812 12V regulator was broken. I fixed it, but this wasn't the main problem – with the 12V regulator disconnected the receiver will power up and, usually, display the blue 'no signal' message though a signal is present.

The mains transformer was in good condition and the PCB tracks to it appeared to be in good order, but resistance checks showed that the connection between one of its pins and the TOP202 chopper IC was open-circuit. A soldered link restored normal results.

The metal earthing spring between the top of the tuner and the metal layer inside the top cover couldn't be found: I soldered a stout piece of wire in its place. If this link is missing, patterning will be seen on the picture when the cover is replaced.

Some case repairs had to be done with a hot-glue gun. In future the receiver will be stored in a place nearer to ground level! **H.C.**

Echostar SR90 VideoCrypt receiver

I'd never come across one of these receivers before. This one was dead. When I checked inside I found that the construction had a Far Eastern look about it. The mains fuse was intact, and there was a fairly standard chopper-type power supply. Two 56kΩ, 1W resistors were connected in series on the PCB, adjacent to the mains rectifier's reservoir capacitor. After discharging the latter I checked the two resistors and found that one them had gone high in value. It seemed best to replace them both: when this had been done the receiver sprang to life.

I noticed that the UHF modulator at the rear of the unit had a slider switch for selection of a 5·5MHz (continental) or 6MHz (UK) sound subcarrier. Modern digital receivers, though not the Sky digibox, have software control of the sound subcarrier and UHF channel frequency – there's no modulator coil that you can twiddle! Worldwide audio subcarrier selection (4·5, 5·5, 6 or 6·5MHz) is via the installation menu. **H.C.**

Pace MSS300

This receiver was dead with the chopper transistor short-circuit. So I fitted the Pace upgrade kit – it's the same as the PRD800 one but with different component reference numbers. When I switched the receiver on again it remained dead. It didn't help that the customer had got a camera/ printer engineer to try to fix the receiver: he had replaced D13 with an unknown type! I replaced R65 (4·7Ω) and D11/12/13 (all type 1N4148) but the receiver still wouldn't start up. The new chopper transistor was short-circuit base-to-emitter. Once I'd fitted a new BUT11A transistor the receiver came to life. **M.M.**

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Servicing

John Coombes on how to tackle the various fault symptoms you could encounter with this VCR

the JVC HRD720

The JVC Model HRD720 was introduced in 1991. It's a well-made, two-speed VCR that's worth repair. The following is a summary of the faults I've encountered with it. The deck is the JVC M3.

Mechanical Faults

Poor recording/fuzzy picture: Head wear is likely to be the cause. If the picture is marred by interference rather than being of overall poor quality, the cause is more likely to be dirt on the drum or somewhere in the tape path. If the drum has to be replaced, ensure that the correct one is ordered – different models in the range use different heads.

Picture marred by interference: Provided the input signal is OK, also the TV set being used for the display, the cause is likely to be dust, dirt or faulty/worn heads. Clean the heads and tape path. Check that the threading is OK. If necessary replace the drum.

Irregular noise bars on picture: Check and adjust the tape path and that the heads and tape path are clean.

Loss of sound-picture sync: This is caused by the tape path between the sound and video heads being incorrect. The most common cause is a damaged loading arm. If the path is too short, the sound precedes the picture and vice versa.

Squeaks: Check mechanical drive conditions and that items such as the head spring are centred correctly and not touching the sides. Check flywheels and tape drive mechanisms. A little grease on the finger tip will often work wonders. Check for plastic rubbing, and look for stickiness in moving parts.

Machine goes to rewind or rewinds when any key is pressed: The end sensor unit is probably faulty.

No rewind and/or fast forward: Check the reel belt then, if necessary, the switch assembly by replacement.

Mechanical/electronic faults

This section deals with symptoms that could have either a mechanical or an electronic cause.

One function not working: Check that the VCR is loading correctly. If not, check the mode switch which could be faulty or incorrectly positioned. If necessary check that the mechacon chip IC601 is operating correctly.

Tape threads but won't play, possibly intermittent: Check that the pinch roller engages after threading, then if necessary for some other mechanical cause – there could be a broken nylon gear or faulty drive to loading gear.

The cause of the fault could lie in the mechacon circuit. Check that IC601's supply (5V at pin 1) is correct, then its inputs and outputs. If necessary check IC601 (M37524M3-151SP) by replacement.

No drum rotation: Check that power is reaching the drum. If not check CP401 (ICP-F15). Check the drum drive assembly, which is usually replaced with the motor.

A full investigation in this area is requires the use of an oscilloscope to check the coil drive waveforms and the outputs from the Hall elements. This is all part of the drum motor assembly, which comes as a complete unit.

Tape damage/tangling: Check whether the reel and/or loading belts are broken or stretched, then whether the pinch roller is worn. Check the tape path: clean if necessary then check adjustments and pressures – look for sticky moving parts. The brake shoes might need to be replaced.

Drum rotates too fast: Check whether the motor drive is correct. If OK, check the motor. The cause is most likely to be in the electronic circuitry however. Check the conditions at the pins of the HD49733NT servo chip IC401. If these are OK the chip must also be OK. In this case check the brake drive.

Shaky sound: Check mechanical parts such as belts, take-ups, clutches etc. for wear. If replacement of any worn items fails to cure the fault, check the capstan motor drive. If the connections and driver chip are OK, check the motor by replacement.

Periodic noise on TV display: The audio-control head could be dirty or worn. If it's OK, check at pins 29 and 30 of the HD49733NT servo chip IC401. No voltage or incorrect conditions here could meant that the chip is faulty. Check the tape transport path if the capstan servo is OK.

Failure to record: If mechanical operation is OK, check the conditions around the video record/playback processor chip IC1 (JCP0016-2) then if necessary the mechacon chip IC601.

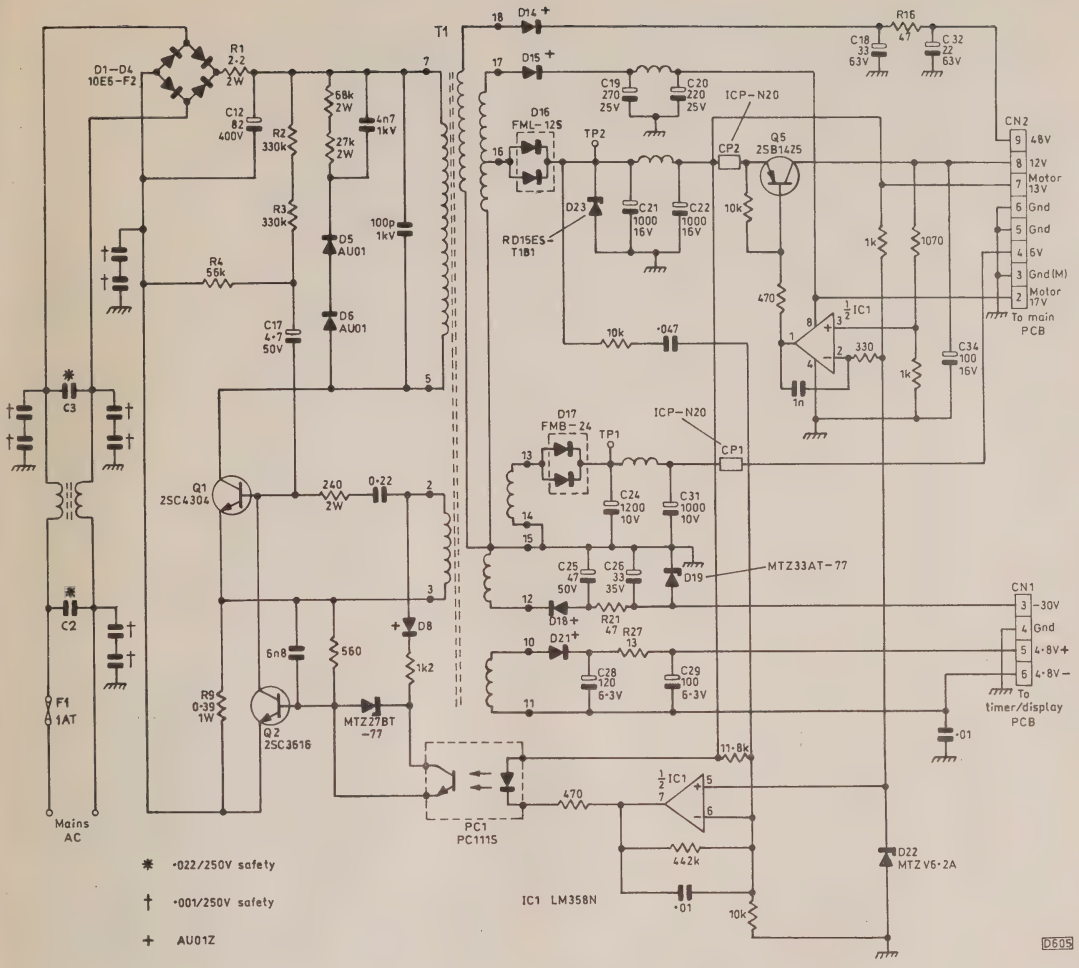


Fig. 1: The chopper power supply circuit used in the JVC Model HRD720 VCR.

Machine switches itself off: Check that the mechacon chip IC601 is receiving correct information from all sources and that its supply and the clock/data lines are OK. A mechanical fault could be the cause of the shutdown.

Rewind faults: If the machine won't rewind to the end, has trouble starting or leaves a loop or loose tape when rewind stops, check the belts which could be worn or misaligned, then the clutches for wear. For any of these faults or failure to rewind automatically, check the supply to the end sensors, then check from the sensors to the mechacon chip IC601. If the output from this chip is incorrect, replace it.

Faulty search: This usually means incorrect operation of the reel belt driven by the capstan motor. If its rotation is too fast there will be only lines on the TV screen, if it's too slow the search will be slowed, if stopped the picture will stop. Check the belt then the clutch assembly and the supply/take-up spools – lubricate the spindles if they are noisy or sticky, preventing free movement. The mechacon circuit could be responsible for the fault. Check the conditions at the pins of IC601. If necessary check it by replacement.

If the search is too fast, check the above points then the conditions around the servo chip IC401. Check for dry-joints, and check the components in the path from this IC.

The Power Supply

Fig. 1 shows the chopper power supply circuit. Further regulators and the power on/off switching arrangement are on the main panel, see Fig. 2. The main items here are Q802 which produces an unswitched 5·8V supply, Q803 which produces a switched 5V supply and IC801 which produces the unswitched 5V supply for the mechacon and other circuitry. On/off switching is carried out by Q801 which produces a switched 12V supply: the on/off switching signal from pin 47 of the mechacon chip IC601 is applied to its base.

No results, mains fuse F1 (1AT) blown: Check the mains bridge rectifier diodes D1-4 (4 x 10E6-F2) and the mains filter capacitors C2 and C3 (both 0·022μF).

No 48V supply: If the 48V supply is missing at pin 9 of

CN2 check D14 (AU01Z), C18 (33µF, 63V), R16 (47Ω safety) and C32 (22µF, 63V).

No 12V supply: There should be 12V at pin 8 of CN2. If not, check CP2 (ICP-N20). If it's open-circuit and a replacement fails, check zener diode D23 (RD15ES-T1B1) and C21 (1,000µF, 16V). If CP2 is OK, check D16 (FML12S) and if necessary the DC conditions around the regulator transistor Q5 (2SB1425-EU).

No 6V supply: There should be 6V at pin 4 of CN2. If this supply is missing, check CP1 (ICP-N20), D17 (FMB24), C24 (1,200µF, 10V) and C31 (1,000µF, 10V).

Electronic Faults

No functions: Check that the mechacon chip IC601 (M37524M3-151SP) is receiving its 5V supply at pin 1. This comes from the UPC24M0HF 5V regulator IC801. Check that the conditions at IC601's reset pin 28 are correct. If not, check zener diode D602 (HZS8.2EB2TJ), C603 (1µF, 50V), R603 (4·7kΩ) and R604 (10kΩ). Check the voltages at the pins of IC601, then if necessary the chip itself by replacement. The CAT35C104P-023 memory chip IC602 is also suspect. Check that the on/off switching works. IC601 produces the on/off output at pin 47. It's applied to the base of Q801 (2SB1425EU) in the regulation section of the main panel

Switches to record during playback: This could be a remote control unit fault. The most likely cause within the VCR is the mechacon chip IC601.

No loopthrough signals, maybe one channel only: Check the aerial connection and the switching in this area. The mechacon chip IC601 is suspect but check for dry-joints in this area. If all channels are affected the aerial socket has almost certainly been damaged.

Noise bar on picture: Once the supply lines have been cleared, check the DC conditions at the pins of the HD49733NT servo chip IC401.

Tape speeds up erratically: Clean and check the capstan motor. Check that the capstan FG signal is present at pin 37 of IC401. If missing, trace back. Check for hairline cracks in the capstan servo circuitry.

Playback faults: If there is no playback picture check the DC conditions at the pins of IC1 (JCP0016-2) on the video board. Otherwise check back from the output.

If the picture or colour shakes from side-to-side, check the motor connections, that the supplies are stable and the servo adjustments, then the conditions around the servo chip IC401 – check voltages and if necessary the chip be replacement.

If the display has no line sync or excessive horizontal sway, check the drum FG/PG waveform (4·2V p-p) at pin 9 of IC401. If this is OK, check the voltages at pins 5-9 of IC401 then suspect the chip.

If there's no playback sound, look for short- or open-circuits and dry-joints in the audio playback circuit.

See also colour faults.

Record faults: If the machine's recordings consist of a blank screen with the sound all right, check the video head terminals. Presence of signals here indicates that the heads are faulty. Otherwise trace back through the video circuitry to IC1 (JCP0016-2). If the recording consists of gibberish in colour, check the DC conditions at the pins of IC1. Otherwise check the erase heads and the drive to them. This also applies when recordings are partial, with some of the original recording left.

If the recorder will not make timed recordings, check the DC conditions at the pins of IC1 (UPD75217CW-073) on the timer/display panel then if necessary at the pins of the mechacon chip IC601 on the main panel. Either chip could be faulty.

See also colour faults.

E-E faults: If there's a hum bar on the E-E picture check the DC conditions at the pins of IC1 (LA7575) in the tuner section. D1 (E452-2) could be faulty. If necessary carry out a systematic check on the diodes and capacitors in this area.

For no E-E sound check the DC conditions at IC1 and for dry-joints and open-circuit components in the signal path.

Interference on the E-E sound is sometimes experienced. First try to adjust it out. Then if necessary check the capacitors in the IF circuitry. Note that adjustments to the coils in this area can be tricky. If adjustment has no effect and the interference is fairly constant irrespective of picture content, check IC1 by replacement. For a faint buzz the official recommendation is to try fitting an attenuator and adjustment of the vision detector circuit. Even this will rarely eliminate a faint buzz altogether.

No record/E-E vision or sound: Check the aerial and TV sockets, and that the tuner is receiving power and a signal input. If so the tuner is suspect, but it's best to carry out scope checks along the signal path – tuner, SAWF and IC1 (LA7575). This IC could be faulty, but first check for 10V at pin 9 – the supply comes via Q3 and Q1. Check the VCO coil T1. Look for dry-joints and broken print/connections in this area. Video muting is carried out by Q18 (DTC144EU) and Q5 (2SK381C), audio muting by Q16 (DTC144EU).

Luminance faults: Check the DC conditions around IC1 (JCP0016-2) on the main panel. If this chip has to be replaced, adjustments will be necessary. This requires an oscilloscope, frequency counter and a DC power supply. It's advisable only in the workshop, with the full service manual.

Nearly all electrical adjustments require workshop equipment and the full service manual for the necessary instructions.

Colour faults: IC1 (JCP0016-2) can be responsible for various faults such as no playback and/or record colour, intermittent colour and poor playback and/or record colour. Check the DC conditions around this chip, also for dry-joints in this area. Make sure that there is 5V at pin 15 of IC1.

Either C71 (0·0027µF) or LPF3 open-circuit will remove the playback colour.

If the above points are OK, a scope is required for signal tracing in the relevant path.

For record colour faults trace the signal back from TP205. Tuning drift will remove the colour in the record mode.

Tuner faults: For drift, try retuning then suspect the 33V stabiliser D2 (HZT33-02). Alternatively the tuner could be faulty. Tuner drift will result in loss of recorded colour and sound. For signal/intermittent signal problems, check the aerial input through to the tuner, then its

power supplies. If incorrect tuning voltage is the fault, first check the unswitched 48V supply then D1 (E452-2), D2 and C8 (10µF, 50V). Intermittent operation suggests the presence of dry-joints or cracks in this area. Failure to change channels, possibly intermittent, also points to dry-joints and D2.

Clock faults: Check for dry-joints on the timer/display panel. If timer/clock data is missing at CN2, IC1 (UPD75217CW-073) is suspect though crystal X1 could be faulty or dry-jointed. First check that IC1's 5V supply is present at pin 64. It comes from regulator IC101 (GP1U541X) via D7. Note that IC1 can be affected by interference, lightning and other influences. It is thus advisable to check whether the clock can be restarted, by switching off at the mains then restarting, before condemning the chip.

The display unit FDP101 can be responsible for no display, loss of digits or loss of complete numbers. First check that data is reaching it from IC1.

Check X1 and IC1 if the clock gains or loses time.

Remote Control Unit

The first, obvious, check when operation is faulty is the batteries and their connections. The contacts could be dry-jointed to the PCB. If necessary check for dry-joints at LED1, LED2, X1 (32·768kHz) and CF1 (400kHz). If the processor chip is faulty it's best to replace the handset.

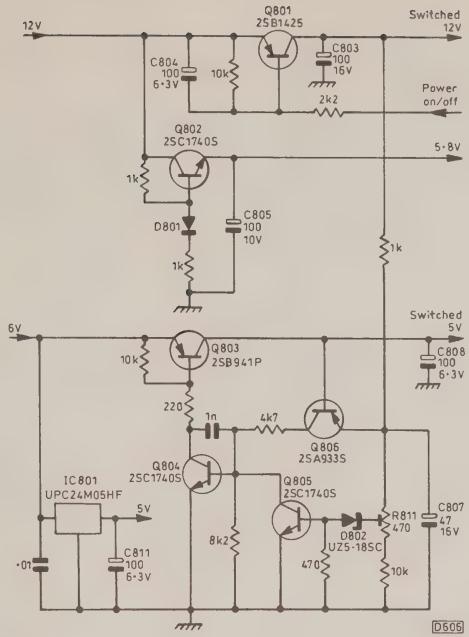
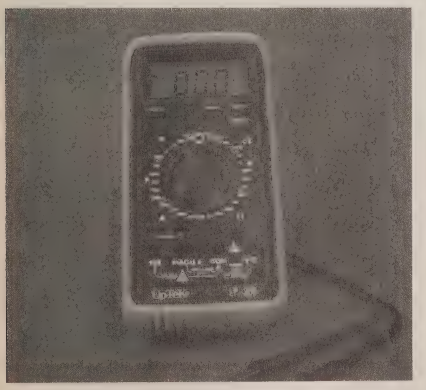


Fig. 2: Regulator and power switching circuitry on the main PCB.



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Rebuilding battery packs

A major expense incurred with high-tech portable equipment is battery pack replacement. It's possible to save on this by rebuilding a pack. Pete Roberts explains how to go about it

One of the major expenses involved in owning today's high-tech portable equipment is that of replacing rechargeable battery packs, particularly when the pattern of use results in a shortening of the battery's design life. Camcorders, mobile phones and laptop computers are commonly programmed to switch off when their supply voltage is low, which will be long before the battery has been fully discharged. On the other hand batteries are often left on charge long after full charge has been achieved. Repeated partial discharge seriously reduces battery capacity with NiCad packs – the so-called 'memory effect' – while continued overcharging, previously thought to be safe at the C/10 rate (charging current in milliamperes numerically equal to one tenth of the battery's capacity), is now known to cause cells to dry out prematurely.

When I was faced with the cost of replacing both my elderly Motorola personal phone's battery pack (at about £25) and the one fitted to my Leading Edge laptop (nearly £100) I decided that I had nothing to lose by attempting to rebuild both packs. Incidentally I've tried all ways of reactivating duff cells in the past, including interesting methods of blasting dendrites with a 10,000µF capacitor. I found that 'reactivated' cells may work all right for a while but soon fall back into their old ways, particularly in a high-current application such as a laptop computer.

Getting in

The first task is to find a way into the offending unit. While some packs appear to have the weight and impregnability of a house brick, they had to be assembled at some stage. And anything that's once been put together can always be taken apart – somehow! If you are lucky, the outer casing will be screwed together, as some high-end computer battery packs are. Usually however you'll be faced with either a rigid plastic casing that's been welded or glued together or a pack of shrink-wrapped cells.

Before you go any further, assuming that the work is being done for a customer, you must make him/her fully aware that the job may not be successful. Otherwise, even though the unit may be scrap, a certain type of customer will not hesitate about taking legal action with a view to getting you to replace the dud pack with a brand new one – free!

When you are faced with a 'sealed' pack the first task is to examine it thoroughly to discover where it has been glued or welded together. Having found the joint, carefully prise it apart by working around it with something like a sharp Stanley knife or a scalpel. Take great care not to penetrate the pack: not only would you run the risk of skewering a cell, but most battery packs contain other necessary bits and pieces that you could damage – we'll come to them later.

Puncturing a cell can be very dangerous. Some years ago I used repair speedway ignition boxes that frequently needed their sub-C NiCad cells replacing. As these were potted in silicone rubber, they had to be literally dug out with an old screwdriver. Many a time I punctured a cell, the result being a spurt of electrolyte. Short-circuiting the internal structure also led to a few burn-ups. This was a job I always did outside, whatever the weather – with my face and eyes well protected. A face full of caustic potash electrolyte would leave you badly scarred.

Shrink-wrapped packs are easier to handle. It's fairly easy to feel the gap between the rows of cells. Make

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Cell removal

The next job is to remove the cells. Carefully extract the cell 'nest' from the casing. Make a careful sketch of the disposition of the cells and their solder tags, together with the positions of temperature sensors and other items, then gently split the assembly apart, noting where cells have been glued together and where adhesive tape has been used to reinforce the assembly. Incidentally when desoldering a thermal fuse you **must** use some form of heat-shunt. Most of those used in battery packs operate at considerably below 100°C, while standard 60/40 solder melts at around 170°C. You must of course take careful note of the inter-cell connections, and retain any pieces of insulating material. Some battery packs use high-temperature cells. If so, the same type must be used as replacements.

Cell types

A lot of small battery packs, such as those used by mobile phones, use standard 'consumer' size cells, commonly the AA. Computer and other large packs are more likely to use industrial sizes such as the sub-C or other non-consumer type. But beware: apparently consumer sizes may have a larger, industrial capac-

Suitable replacements are readily available from industrial electronic suppliers RS and Farnell as well as CPC. Don't take size for granted. After confirming the cell type and capacity, measure the size of the original cells as accurately as you can. Order those of identical or, if not available, a slightly smaller size. Bear in mind that the size of a given type of cell does vary slightly from brand to brand.

Don't even think of replacing only the faulty cells. Always replace the lot. If new cells are mixed with old ones there's a risk of reverse charg-

Individual cells will almost certainly have been assembled into 'sticks', i.e. a number of cells mounted nose-to-tail, or 'plates', i.e. cells mounted side-by-side. If you are lucky, the cells you require may be available already preassembled in sticks that contain the correct number of cells. Otherwise you will have to remake the sticks by soldering cells together in series. Take care over polarity – it's very easy to wire in a cell backwards – and make the soldered joints as quickly as possible.

If the original stick was fitted in a

Fig. 2: Battery pack thermal fuse.

Fig. 3: Extra insulation (glass fibre tape) added in a mobile phone battery pack.

cardboard sleeve, refit it. Don't omit to refit all pieces of insulating material in their original places. Extra insulation may be needed should positive solder tags end up squashed against the cell's plastic wrapping. You can see in the photo (Fig. 3) extra insulation I fitted, made from glass-fibre tape, at the tops of the cells in my mobile phone's battery pack. Red fibre washers are excellent for this task: use one that fits snugly round the cell's positive pip. Don't use PVC tape, which is easily punctured.

Most battery packs have a moulded base that's shaped to hold the cells. With this type all that's necessary is to fit the cell sticks into the bays. In all the packs I've come across the cells have been secured with hot-melt glue, so that's what I use when reassembling the pack. Where the casing has no bays, the cells will have to be glued together with fast-setting Superglue before being finally secured with hot-melt glue. Some battery packs are curved, so make sure that your cell assembly is correctly shaped before gluing up. Where adhesive tape was used in the assembly you could use standard Sellotape. I prefer to use the yellow polyester tape commonly employed in transformer construction however. It's available from Farnell and RS in a variety of sizes.

Final interconnections

Once the cells have been mounted the final interconnections have to be made. Never leave out a thermal fuse or other safety device, and don't forget that heat-shunt when resoldering the thermal fuse. Don't omit whatever type of temperature-sensing device was fitted, and bear in mind that while thermistors are not polarity sensitive all semiconductor devices are.

Fig. 4 shows my complete laptop battery, rebuilt with NiMH cells, prior to refitting the outer cover. The final step is to assemble the outer casing and reglue the joint you originally prised apart. Packs with shrink-wrapped outer covers, like my laptop battery, can either be rewrapped with new heatshrink sleeving or the original material can be reused, fixed in place with glue and/or adhesive tape.

Fig. 4: Laptop battery pack rebuilt using NiMH cells.

Testing

If you have access to the correct charger, it's a good idea to test the pack before you return it to the customer. This would probably not be a problem with camcorder or mobile phone batteries where the appropriate charger is available. Computer batteries are invariably charged when fitted in the machine so, unless you can persuade the owner to leave the computer and its power supply, you'll have to use a bench supply to charge the pack or just hope for the best.

Don't forget to tell the customer that the rebuilt battery won't attain full capacity until it has been cycled a few times.

Upgrades

I mentioned earlier that a rebuild presents you with an opportunity to upgrade a battery pack, using nickel-hydride cells. NiMH cells are lighter than NiCad ones and provide a larger cell capacity for a given size. They can be repeatedly part charged and discharged without suffering any loss of capacity. On the downside they are still fairly expensive, and my own experience with them has convinced me that fast charging or over-charging can severely curtail their life.

From our point of view NiMH cells can be charged in exactly the same way as NiCad ones, though the higher capacity will call for a correspondingly longer charging period. Charging systems that depend on temperature rise to detect full charge will work in the same way with NiMH batteries: adjustment may be needed with those that depend on final battery voltage.

In conclusion

While most battery repairs shouldn't cause you any great problems, I personally wouldn't handle medical battery packs. Make a mistake and a vital piece of life-support equipment could fail – you could be left facing a manslaughter charge. You might still end up as the fall guy even though the failure is in no way connected with your work – few if any lawyers are technically qualified, and they will always seek an easy target.

Finally, remember that under current EU regulations batteries that contain heavy metals such as lead and cadmium must not be disposed of as part of domestic or normal workshop waste. Some suppliers will take your old cells for return to the manufacturer for recycling. Otherwise a local scrapyard would no doubt be happy to take them off your hands.

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VALUE	CODE	PRICE	PER PACK
35 volts			
10uF	CAP52	50p	10
22uF	CAP53	45p	10
33uF	CAP54	50p	5
47uF	CAP55	85p	10
100uF	CAP56	85p	10
150uF	CAP57	95p	5
220uF	CAP58	145p	5
680uF	CAP59	650p	10
1000uF	CAP60	435p	10
2200uF	CAP61	245p	2
3300uF	CAP62	1000p	5
50 volts			
10uF	CAP63	50p	10
22uF	CAP64	70p	10
47uF	CAP65	85p	10
100uF	CAP66	85p	10
220uF	CAP67	175p	10
330uF	CAP68	245p	10
470uF	CAP69	435p	10
680uF	CAP70	490p	5
1000uF	CAP71	525p	10
2200uF	CAP72	325p	2
63 volts			
0.47uF	CAP73	35p	10
1uF	CAP74	35p	10

VALUE	CODE	PRICE	PER PACK
63 volts continued....			
2.2uF	CAP75	35p	10
3.3uF	CAP76	50p	10
4.7uF	CAP77	35p	10
10uF	CAP78	50p	10
15uF	CAP79	95p	5
22uF	CAP80	75p	10
33uF	CAP81	85p	10
47uF	CAP82	95p	10
68uF	CAP83	130p	5
100uF	CAP84	120p	10
150uF	CAP85	280p	5
220uF	CAP86	280p	10
330uF	CAP87	400p	10
470uF	CAP88	525p	10
680uF	CAP89	500p	10
1000uF	CAP90	540p	5
100 volts			
0.47uF	CAP91	50p	5
1uF	CAP92	85p	10
1.5uF	CAP93	70p	5
2.2uF	CAP94	50p	5
3.3uF	CAP95	50p	5
4.7uF	CAP96	50p	5
10uF	CAP97	95p	10
22uF	CAP98	105p	10

VALUE	CODE	PRICE	PER PACK
100 volts continued....			
33uF	CAP99	155p	5
47uF	CAP100	175p	10
100uF	CAP101	210p	10
220uF	CAP102	600p	5
470uF	CAP103	600p	5
250 volts			
3M3	CAP104	175p	10
10uF	CAP105	260p	10
47uF	CAP106	435p	10
400 volts			
1uF	CAP107	215p	5
2.2uF	CAP108	225p	5
4.7uF	CAP109	315p	5
10uF	CAP110	400p	5
22uF	CAP111	250p	2
47uF	CAP112	350p	2
450 volts			
1uF	CAP113	280p	5
2.2uF	CAP114	320p	5
4.7uF	CAP115	495p	5
10uF	CAP116	550p	5
22uF	CAP117	415p	2

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Standard 21 Pin Connected (0.5m)	PLG24	85p
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Description	Order Code	Price
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Scart to 2 phono plugs 1m (Stereo Audio Only)	PLG38	120p
Scart to 2 phono plugs 5m (Stereo Audio Only)	PLG39	200p
Scart to 3 phono plugs Gold 1.5m (Stereo /Video 1 way)	PLG40	250p
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Switched scart to 3 phono plugs Gold 1.5m	PLG42	300p
Switched scart to 3 phono plugs 1.5m	PLG43	200p

Phono to Phono Leads

Description	Oorder Code	Price
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Phono plug to phono plug 1.2m	PLG30	40p
Phono plug to phono plug 5m	PLG31	90p
Phono plug to phono socket 5m	PLG32	90p
2 phono plugs to 2 phono plugs 1.2m	PLG33	75p
2 phono plugs to 2 phono plugs 5m	PLG34	100p
2 phono plugs to 2 phono sockets 1.5m	PLG35	75p
3 phono plugs to 3 phono plugs 1.2m	PLG36	90p

Transistors / Linear IC's

BU208A	75p	BUT18AF	65p	MJ15003	250p	TIP31A	22p	LM2406T	400p	STR10006	450p	TA8427K	200p	TEA2164	160p	UC3843AN	80p
BU2508A	100p	BUT56A	65p	MJ15004	300p	TIP32A	21p	LM2416T	650p	STR20005	450p	TA8718N	550p	TEA2260	225p	UC3844	70p
BU2508AF	110p	BUW13A	200p	MJ15015	250p	TIP33	50p	LM324	30p	STR40090	350p	TDA1170N	85p	TEA2261	185p	UC3844AN	80p
BU2508D	130p	BUZ80	135p	MJ15016	350p	TIP33C	60p	LM339	35p	STR4211	315p	TDA1175	175p	TEA2262	275p	UC3845AN	80p
BU2508DF	120p	BUZ80AF	200p	MJ15022	400p	TIP34C	60p	LM393	45p	STR440	800p	TDA1180	120p	TEA5101A	300p	UPC1188H	350p
BU2520AF	170p	BUZ90A	180p	MJ15023	400p	TIP35C	65p	LM723	40p	STR441	950p	TDA1518BQ	240p	TEA5101B	175p	UPC1488H	115p
BU2520DF	225p	BUZ90AF	280p	MJ15024	400p	TIP36C	65p	SAA1293	550p	STR44115	475p	TDA1557Q	300p	TEA5170	200p		
BU2525A	325p	BUZ91A	260p	MJ2501	100p	TIP41A	20p	SAB3035	275p	STR451	800p	TDA1558Q	300p	UC3842N	60p		
BU2525AF	220p	IRF510	70p	MJ2955	55p	TIP41C	22p	STK4131	480p	STR4512	400p	TDA2004	150p	UC3842AN	80p		
BU2525D	240p	IRF520	75p	MJE13007	100p	TIP42C	22p	STK4141 II	420p	STR50103A	260p	TDA2005	150p	UC3843	80p		
BU2527AF	400p	IRF530	75p	MJE13009	100p	TIPL791A	80p	STK4142	530p	STR54041	320p	TDA2030	80p				
BU426A	70p	IRF540	100p	MJE18004	125p	AN5151	200p	STK4151	680p	STR58041	250p	TDA2030H	100p				
BU508APH	60p	IRF610	80p	MJF18004	175p	AN5601K	750p	STK4152	650p	STR59041	300p	TDA3562A	260p				
BU508D	75p	IRF620	100p	MJF18006	200p	BA5406	180p	STK4171	900p	STR6020	270p	TDA3653B	80p				
BU508DF	85p	IRF630	75p	MJF18204	350p	BA6209	85p	STK4172 II	680p	STR61001	475p	TDA3653C	85p				
BU508V	110p	IRF640	150p	MJW16206	600p	HA13150A	1150p	STK4191	700p	STR81145	375p	TDA3654	80p				
BUF405A	200p	IRF710	150p	MJW16212	350p	HA13151	875p	STK4332	365p	STRD1706	360p	TDA4565	150p				
BUH1215	450p	IRF720	85p	S2000A3	175p	HA13152	800p	STK5331	300p	STRD1806	360p	TDA4600	200p				
BUH315	200p	IRF730	125p	S2000AF	90p	HA13153A	900p	STK5332	180p	STRD1816	350p	TDA4600 II	160p				
BUH315D	175p	IRF740	90p	S2000N	150p	HA13155	920p	STK5333	650p	STRD4420	550p	TDA4601	120p				
BUH515	200p	IRF820	90p	S2055A	175p	HA13157	950p	STK5337	500p	STRD6108	450p	TDA4605	190p				
BUH515D	250p	IRF830	85p	S2055AF	175p	LA4440	200p	STK5481	470p	STRS6707	1000p	TDA4950	100p				
BUH517	275p	IRF840	85p	S2055N	150p	LA4445	200p	STK5482	285p	STRS6708	575p	TDA8170	170p				
BUH517D	175p	IRF9610	95p	TIP121	35p	LA4460	120p	STK73410	350p	STRS6709	600p	TDA8171	230p				
BUH715	425p	IRF9620	85p	TIP122	30p	LA4461	120p	STK73410 II	500p	STV9379	400p	TDA8172	200p				
BUT11A	35p	IRFBC30	120p	TIP125	30p	LA4705	400p	STK7348	400p	TA8207K	175p	TDA8350Q	275p				
BUT1AF	35p	IRFBC40	210p	TIP127	35p	LA7830	90p	STK73605	375p	TA8215	300p	TDA8362N3	1200p				
BUT12A	80p	IRFZ44	160p	TIP2955	50p	LA7851	200p	STK73907	700p	TA8221AH	600p	TEA1039	150p				
BUT12AF	90p	MJ11015	250p	TIP29A	22p	LM1207N	450p	STK7406	650p	TA8227	250p	TEA2018A	80p				
BUT18A	80p	MJ11016	300p	TIP3055	50p	LM2405T	625p	STK7563F	650p	TA8251AH	700p	TEA2037	200p				

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Dealing with PCB Cracks

Repair of a cracked PCB involves the board itself and the tracks concerned. Paul Smith on how to go about it

As PCBs have become thinner, with less framework to support them, the number of sets that appear in the workshop with a cracked PCB has increased. There are several methods of repairing broken tracks. These are described below, along with their advantages and disadvantages. The first step however is to stabilise the crack itself.

PCB Repair

Except where the damage is of a very minor nature it's best to remove the PCB from the set. Place it flat on the bench and mate the two split portions as closely as possible to their original positions. If necessary they can be held on the bench top temporarily with tape, clamps or wedges.

Mix some epoxy resin adhesive and place small blobs of it along the crack, on the component side of the board (in between the components). If the chassis slides into thin runner guides in the cabinet, take this into account before you apply any glue close to the edges of the PCB.

When the resin has set, examine the crack closely. If it has definite ends, i.e. from one edge to another or to a preformed hole, it will not creep with movement. If it fades into the board however, find the end of it and drill a small hole here. This will prevent the crack spreading with time.

When not to attempt it

Two recent cases that appeared in our workshop are classic examples of when not to tackle a repair of this type. Both sets were less than a year old – one was only two weeks old – but because of the damage they were not covered by the manufacturer's guarantees. They could have been claimed for legitimately on insurance policies, but as neither owner had cover repairs were attempted.

With both sets over fifty links, using a combination of the methods described below, were necessary. On completion of the work, which took over two hours in each case, the sets were tested. One had field linearity and video faults. The other one ran hot and would cut out every ten minutes. Both defied all logical (and sometimes illogical) attempts at diagnosis and, because of their cause, these were probably one-off faults. The end result was that one set had to be fitted with a new chassis while the other one was scrapped.

The moral here is: if it looks like an impossible job, it usually is!

Track Repairs

There are four basic methods of carrying out track repair, as follows:

(1) Scrape the coating off the track on each side of the crack and apply solder along the track. This is a quick, cheap and easy approach to the problem. The disadvantage is that the repair will be weak – solder can fracture at an early stage – and unreliable.

Keep the board flat, and allow the solder to flow naturally.

(2) The second method is the same as the first but using liquid silver instead of solder. It's suitable for contact lands in remote control units. Disadvantages are that the repair can be messy, that the silver takes time to dry, and that a small bottle of the liquid costs about £5 and the bottle fractures easily if knocked.

Apply the liquid silver with a small screwdriver or a piece of fine wire. Mask the surrounding area to produce a channel for the silver to flow into – remove the tape when the liquid has set. Note that silver does not become fully conductive until dry. When the liquid is not in use, keep the bottle upright with its top firmly secured.

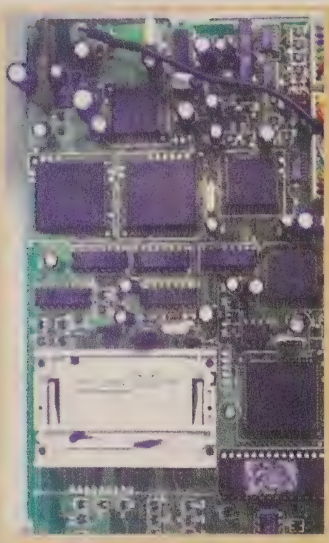
(3) Again as (1), but apply thin wire into solder across a crack. This is a neat, flexible solution but is difficult to implement when the tracks are thin and close together.

Use a single strand from multi-strand cable. Check very carefully that the wire does not short to adjacent tracks.

(4) Solder PVC-insulated wire to the first available land at each side of the crack. This is strong, and is less frustrating than method (3). But the finished result can look messy and the wire can obscure tracks as work progresses. Take care that tracks are followed to the correct lands.

Use single-strand insulated wire and keep the wires as short as possible. For short lengths, remove approximately 2mm of insulation from a longer length of wire, cut off the required lead length then push the insulation along the core so that there's an equal amount of bare wire at each end. Avoid the edges of the PCB if it slides into grooves. If necessary use the service manual to ensure that the correct lands are linked.

Satellite WORKSHOP



Jack Armstrong

Christmas was fairly quiet for the trade in my neck of the woods. Fortunately I didn't get any of those Christmas day calls to tune a video that the owner has been "meaning to get fixed for months". I'm pleased that no one phoned, because a rude reply can offend.

The weeks since have been busy but uneventful. There have been fewer analogue repairs than previously, as Sky Digital gradually takes over, but higher sales of accessories – including digibox remote control handsets, 'TV eyes', scart leads and scart switching boxes.

Digiboxes are now beginning to fail outside their guarantee period. I heard that one customer had been quoted £300 for a replacement Amstrad DRX100 "because nobody repairs them" (if you do, please let me know!). For this reason alone I think I would prefer to have one of the other three brands.

Our heading photograph shows the 182-0163203 D2-MAC decoder board used in the Pace Model MSS260G and some MRD950+ and MRD960+ receivers.

Pace MRD960+

This receiver arrived by carrier with a note that said "streaky decoded pictures". The card supplied with it was one of those naughty ones that have two ICs soldered to them. One of the problems with these 'cards' is that they are made of fibreglass laminate, which is twice as thick as a plastic smart card. In addition the edges are sharp and the contacts are soldered instead of being gold-plated.

The sharp edges often damage the gold-plated spring contacts inside the card reader slot, so I filed them until the front edge of the card was nicely rounded. I couldn't do anything about the lack of gold plating. In theory the solder coating will produce a bad connection, the result being intermittent operation. In practice however this seldom seems to happen.

The card now slid easily into the slot, but I was careful to place my free hand on the receiver's metalwork to equalise the potentials – it's very easy to discharge body static through the card and destroy the card reader IC inside the receiver.

On test the receiver produced pictures that were obscured by short, black horizontal lines. Channel tuning didn't improve the picture, and the on-screen menus floated diagonally across the screen. A Relkit had already been fitted, so most of the capacitors in and around the power supply were new and of the correct low-ESR type.

I measured the ESR of the electrolytic capacitors around the tuner and found that the readings were within acceptable limits. But my Genie ESR meter showed that several of the electrolytics on the D2-MAC decoder board were not so healthy. C72 (220µF) was the cause of the short, black horizontal streaks, while C39 (100µF) was the cause of the menus drifting across the picture. I replaced nearly a dozen capacitors in all before I was happy with the picture quality.

I was puzzled however because the component reference numbers didn't tally with those in the circuit diagram. In fact the layout of the decoder was quite different from the picture in the service manual. Even the lads at Pace Technical couldn't explain the differences until I gave them a detailed description. It transpired that the D2-MAC board was for Model MSS260G, and that quite a lot of MRD950+ and MRD960+ receivers had been built with this board (182-0163203) instead of the older version (182-0163105) used in the MRD950/960.

Pace Prima

The proprietor of a local TV shop brought this receiver in for repair. "It goes dead after five minutes" he told me.

I left it on test for several hours, but it refused to die. When I looked inside I found that it was in a bit of a mess. Someone had clearly attempted to fix the intermittent fault and had resoldered every joint in the power supply. A pity they hadn't used some flux! Someone had also smashed the channel up/down buttons. I replaced these and tidied up the soldering. When the receiver was put on test again the intermittent fault still refused to put in an appearance. As the shop's customer was desperate to have the receiver returned, I swapped over the mother board with one I had in stock and returned the unit.

The following day I plugged in the old board for more tests. It refused to light up! The power supply was pulsing, and occasionally the standby LED would light then go out again after a few seconds. I had checked all measurable components, and had added heatsink compound to the TOP201 chopper IC, without success. On a hunch, I decide to replace the TOP201 device with the slightly better rated TOP224. This provided a complete cure.

Early units were fitted with a TOP201, but I suspect that it is slightly underrated – especially when heatsink compound isn't used!

Circuit Design

Many readers probably design simple electronic circuits from time to

time and need a way of drawing them quickly and easily. I recently downloaded an excellent software application to do just that! It's called "DesignWorks Lite v4.0" and is available, for both Macintosh and Windows PCs, from Capilano Computing's web site at http://www.capilano.com

The demonstration version works for three weeks – long enough for you to decide whether it's worth paying a £25 registration fee! I have been using the "Lite" version for several weeks and it has been a godsend (I do quite a lot of circuit design). It comes with a library of symbols (US), but it's quite easy to create your own additional symbols if required.

There is also a "professional" version that has lots of other features, including "Spice" models.

Pace MSS1000IP

This model is notorious for overheating – it has Dolby Pro-Logic and dish positioner boards inside. If people would install the unit in a sensible place, say a nice open shelf in a cool room, there would be no problem. But modern 'hi-fi' cabinets and central heating ensure that these receivers require constant attention.

This one came in because it produced the usual intermittent "motor error" and "no signal" messages. So I fitted the capacitors in Relkit 10. Doing that cleared up these faults, but the contrast was now apparently switching itself from high to low and back again every few minutes. This affected the picture from the RF modulator, not the outputs from the scart connectors.

I traced the cause to Q61 (BC846B), the emitter-follower in the video feed to the modulator, and fitted the other four surface-mount transistors from Trankit 10 for good measure.

Finally the pctures were very streaky. I traced the cause of this, using my Genie ESR meter, to C502 (1,000µF, 16V) which is next to the tuner.

Pace PRD800

This receiver had been well cooked. I fitted the parts in Relkit 1, but the pictures were still 'streaky'. It seemed sensible to check the electrolytic capacitors associated with the video path, using my Genie ESR meter. C87, C98, C99, C100, C107, C108, C109, C196 and C562 (all 10µF) around the Nicky chip U9, also C91 (100µF, 35V) next to the tuner and C97 (1µF) and C71 (10µF) which are in front of the RF modulator, proved to be in need of replacement.

It would have been sensible to fit a fan, but the elderly owner did not want this done – reckoned he'd be dead my the time any further faults might arise!

Jack Armstrong is willing to try to sort out readers' satellite TV receiver problems by e-mail. You can reach him via the Internet web site at:

http://www.ukstay.com/jack

If you have no internet access you can write to him c/o Television, Room L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Please enclose two first-class stamps.

Test Case 447

While those of us in the Test Case workshop are very familiar with JVC video recorders our experience of JVC TV sets is very limited. Maybe this is because JVC is not as big in the TV as the video field, or because the company's TV sets don't feature much amongst the rental receivers we look after. Either way, we could have done better in dealing with a call out to one recently!

It all started with a telephoned request to go and look at a large-screen JVC set. The fault symptoms were many, various and vague. Could we have the model number? Apparently not. What was the screen size? Big. How old was it? This wasn't known. Surely, they asked, we wouldn't charge just to come and look at it? Did we do free call-outs and estimates? No our Pam said. Then, having obtained agreement to pay a call-out/inspection fee, she booked the job. Doc Colin was lumbered with it.

When he arrived he found that the set was a Model AV28WX1EK, about three years old. He was told that the set had been a bequest from a distant (in space!) relative, had been transported a long way by carter, and had taken the place of a more robust 21in. model that had been relegated to another room. The main problem was that one of the terrestrial TV channels was missing: instead of a picture, a blue screen appeared. The other channels weren't too good either until they had been tuned in by the Doc. Despite not having a user handbook, this was not *too* difficult.

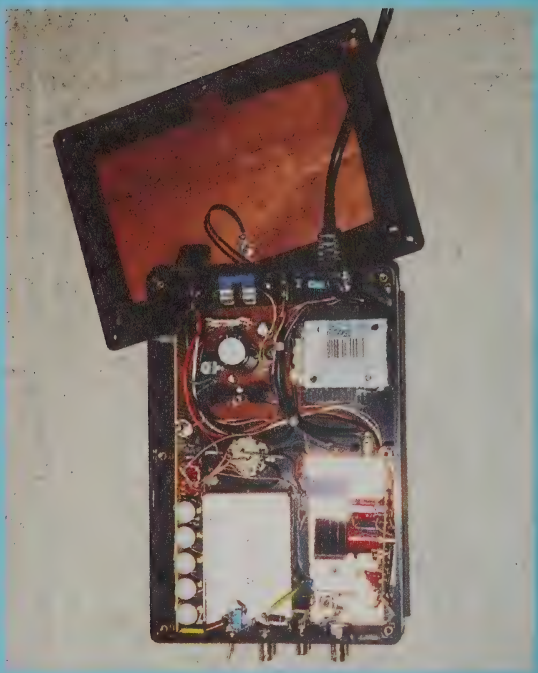
The next problem was no sound from the speakers that had been connected to the rear output sockets – this model incorporates a Dolby Pro-Logic decoder. This seemed to be an easy matter to sort out. The phono sockets provide audio signals at 'line' level, which is far too low to drive directly-connected speakers. So Colin wired them to the AUX-IN sockets of the hi-fi outfit, whose speakers were at the 'back' of the room. This was a sensible move, but there was still no sound! Why? It seemed unlikely that the set's decoder/amplifier had failed.

The third problem was the that the VCR, which had previously been used with the 21in. set, produced only black-and-white pictures when its output was fed via a scart lead to the JVC receiver. Colour had been present in full measure with the 21in. set. When the output from the VCR's modulator was selected by the receiver's tuner the picture came up in colour. The plot thickens!

Nor was this all. Regardless of the input source, the picture's contrast level went up and down with changes in the light level in the room. With all the lights out in the evening the picture was soft. When the main room lights were switched on the picture contrast increased to produce a harsher image. If the user went up to the set to fiddle with it, the picture contrast would reduce again!

The set's new owner put all these problems down to it being a widescreen model, and added a few moans about the compromises involved when conventional (4:3 aspect ratio) pictures were viewed. Were these various symptoms caused by faults within the set? Certainly they couldn't have been present with the older 21in. set. For the solution, turn to page 311.

An off-air signal is often required when working on audio and video equipment. Keith Cummins has designed this conveniently small unit, based on a low-priced tuner-IF module, that provides video, audio, FM mono sound and 12V outputs. The article is in two parts



Off-air test signal source

A 'real' signal is often required, to complement an AF oscillator and TV pattern generator, when work is being carried out on audio and video equipment. With this need in mind I designed a piece of equipment that I originally called my "black box". It's conveniently small at 220 x 150 x 64mm. The unit accepts a UHF analogue TV signal and has a five-channel selector switch (this number could be increased if required – see later). When all the options are included, it provides the following outputs:

(1) Video, positive-going, at 1V peak-to-peak, 75Ω impedance.

(2) Audio to drive an amplifier, at 1·2V peak-to-peak, 47kΩ impedance.

(3) Audio at 4Ω impedance, to drive a speaker. Power approximately 2W.

(4) An FM mono signal that can be reproduced via an adjacent FM radio or tuner.

(5) A DC level that indicates input signal strength.

(6) A switched 12V supply to operate ancillary equipment, e.g. an aerial amplifier.

(7) An unswitched 12V supply that's constantly available whenever the unit is powered.

This output, which is protected by a 1A fuse, enables the unit to be used as a small power supply.

Outputs (3) and (4) are optional: you don't have to fit the modules that provide them if you feel that these outputs are unlikely to be required.

The good news is that the main items involved are available cheaply from Sendz Components. The double-insulated power supply, which needs a simple modification, costs £2 while the tuner-IF unit costs £3. Sendz can also supply the tuning potentiometers, which fit Veroboard, at eight for 50p. They have assured us that plenty of these items are in stock. Other items used are available from Maplin Electronics – a full list will be provided in Part 2 next month.

Basic arrangement

Fig. 1 shows the interconnections between the modules in a unit that incorporates all the options. We'll start with an basic description of what goes on.

As it comes, the power supply provides stabilised 12V and 24V outputs. Remove the unit from its case, then connect the 24V supply in series with the 12V supply. This modification provides 12V and 36V outputs. Transplant the unit's innards to the black box.

The 12V supply feeds all the modules while the 36V supply is used for tuning. When you consider the small current needed for the tuning potentiometers, this really is like using a steam-hammer to crack a nut, but who cares when the power supply has cost only £2!

Pragmatism rules in this case, and the small loading ensures that the stability of the supply is excellent.

The 12V and 36V outputs from the power supply are taken to the 'on-off and channel-selection module', which is a piece of stripboard with flying leads to the channel selection switch, the indicator LED and other modules. The channel-selector switch has six positions, off plus five channel selections. Once the switch has selected a voltage from one of the preset potentiometers it's passed to the tuner-IF unit.

The tuner-IF unit

There were no connection details when the tuner-IF unit, which is in a single can, arrived. So I had to do a bit of investigation. The unit is marked with connections as follows:

BU: The supply to the RF stage and oscillator/mixer.

VT: The tuning voltage.

AGC: A DC output that varies with signal strength.

AFT: For automatic fine tuning. AFC action is disabled when this pin is clamped at 6V.

B: 12V supply input for everything except the RF section.

8: Not identified.

9: Audio output.

10: Not fitted.

11: Not identified.

12: Not identified.

13: Video output.

The aerial input consists of a phono socket. There is of course a chassis (0V) connection.

The tuner-IF unit gives excellent results: definition is good, and the sound background is very quiet, without a trace of intercarrier buzz. It may be necessary to adjust the AFT discriminator. If so, it's easy and will be fully described in the setting-up procedure. The unit also appears to be sensitive, with a good signal-to-noise ratio – great value for £3!

No circuit details are available. In the list above pins 8, 11 and 12 are shown as unidentified. This doesn't mean that they cannot be used. I've simply had no need to find out what they are intended for. Maybe someone out there has a circuit diagram for a Sharp TV set that uses this unit and can tell us what the functions of the unidentified connections are.

On-off and channel selection unit

Fig. 2 shows the circuitry on the on-off switching and channel selection board. The arrangement I adopted came about simply because I happen to have a box full of 12V reed relays. A single double-pole relay could be used, or no relays with a separate two-pole switch. The latter would enable six or more channels to be selected. These points are left to the constructor to decide about.

My arrangement is so simple it hardly requires description. When the wiper of SW1b is connected to a grounded contact, current from the 36V rail activates the relays and lights the on LED. RL1's contacts connect the 36V supply via R2 to the parallel-connected tuning potentiometers RV1-5. SW1a selects a potentiometer and thus a channel. RL2 connects the 12V supply to the rest of the unit. Because a large capacitor (C2) is used to decouple the 12V feed to the tuner-IF unit, R4 is included to limit the inrush current handled by the reed relay (RL2).

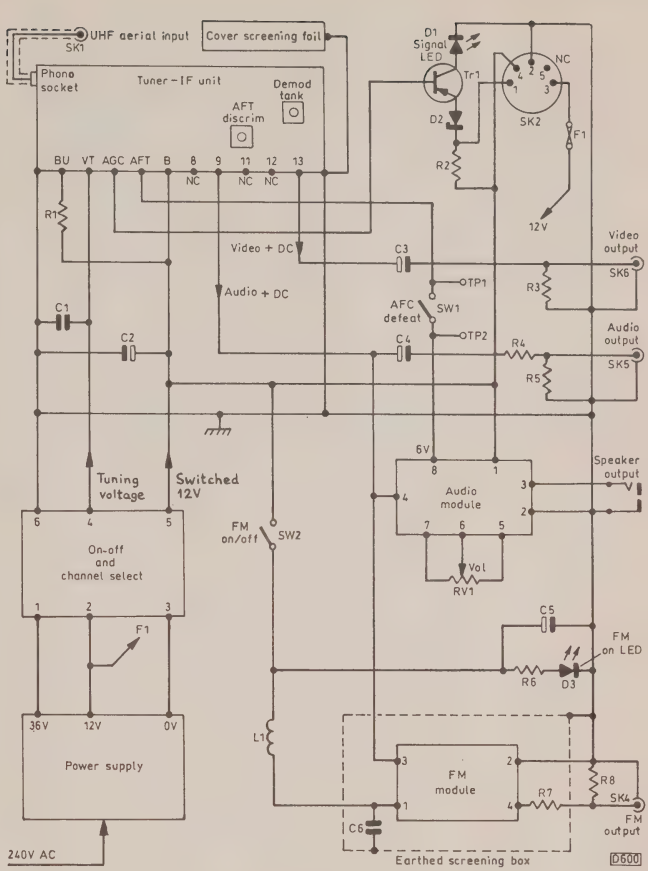


Fig. 1: Interconnections between the various modules in the off-air signal source unit.

Tuner inputs/outputs

The aerial input to the unit is connected to a conven-

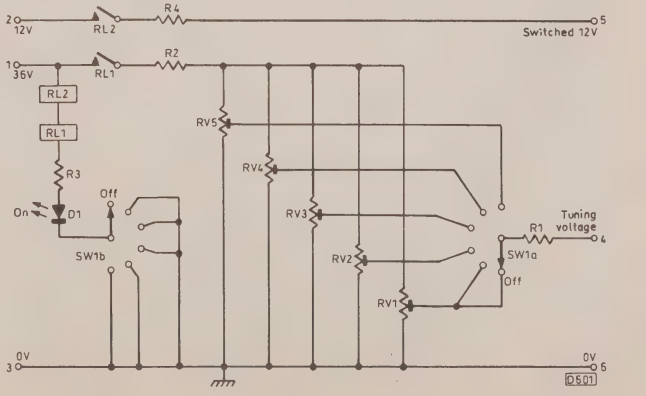


Fig. 2: On-off and channel selection switching.

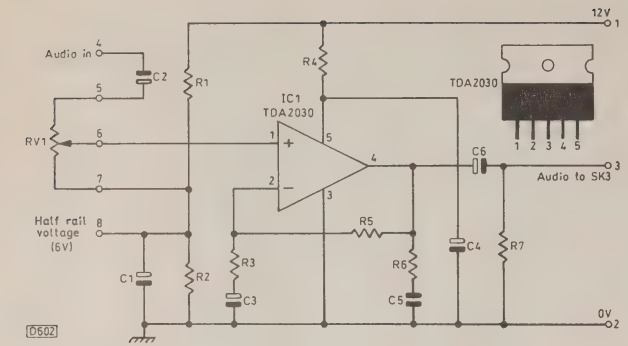


Fig. 3: Audio module circuit. The tab of the TDA2030 chip is connected to pin 3 internally. The use of screened twin cable for the connections to the volume control is recommended, with the screen connected to terminal 7.

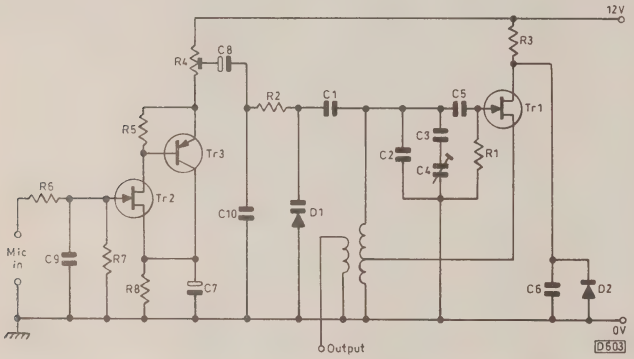


Fig. 4: Circuit diagram of the Velleman P1771 FM transmitter module.

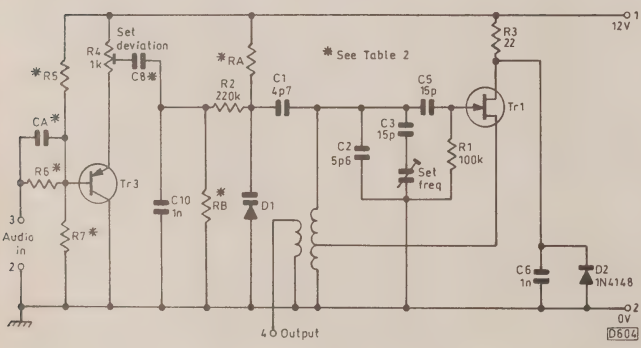


Fig. 5: The Velleman module after modification.

tional coaxial socket then, via a short length of coaxial cable, to a phono plug that fits the tuner's input. In this design use is made of three outputs: AGC voltage, audio and video.

With no signal input the AGC voltage is at a maximum, about 7·25V. With a very large signal input the AGC voltage falls to about 2·25V. D1, the signal LED (yellow), lights with an intensity that depends on signal strength. The circuitry is shown in Fig. 1 and works as follows. The tuner's AGC output drives the base of the pnp transistor Tr1, whose emitter is connected to the switched 12V supply via the 5·6V zener diode D2 and R2. D1 is connected between the collector of Tr1 and chassis (0V). As the AGC voltage drops with increasing signal input, the offset voltage introduced by D2 is exceeded and the current through Tr1 and the signal LED D1 is determined by the voltage developed across R2.

If a more precise indication is needed, the voltage developed across R2 can be measured by connecting a meter between pins 1 and 4 of socket SK2. The voltage varies as shown in Table 1, taking a signal input of approximately 4mV as an arbitrary 0dB level.

The audio output, at 1·2V peak-to-peak, is present at pin 9. It sits on a DC level of 5V. This signal is fed to the phono audio output socket SK5, to the audio amplifier module and the FM module. The latter two modules are optional: you can fit neither, either or both depending on your requirements. The audio output at SK5 is buffered by R4, which increases the output impedance to 47kΩ. R5 completes the path to chassis, enabling the coupling capacitor C4 to charge under all conditions.

The tuner's video output, at pin 13, is fed to the BNC video output socket SK6. Unloaded, it's a 2V peak-to-peak positive-going signal on a DC level of 4V. C3 blocks the DC component, R3 allowing C3 to charge if there's no connection to the video output socket. When the output is loaded at 75Ω, the level falls to 1V peak-to-peak. From this it follows that the output impedance is 75Ω and there's no need to include a buffer stage. The output appears to drive a correctly terminated 75Ω coaxial cable without difficulty. Apart from being used to drive a monitor, this output can also be connected to an oscilloscope, enabling both analogue and digital signals to be examined.

The audio module

The audio module is based on the useful and robust TDA2030 power op-amp chip. I have used this IC in several projects and have never had a failure – the output can be short-circuited without the device blowing up. The audio module is built on a 25 x 60mm piece of Veroboard and is thus quite compact. A small heatsink is required for the TDA2030 chip.

Fig. 3 shows the circuit of the audio module. R1 and R2, decoupled by C1, provide a 'half-rail' voltage (6V) which, via the volume control RV1, biases the TDA2030 chip (at pin 1) to half way between 12V and 0V. Thus the device's output swing can be nearly ±5V which, if you do your sums, works out at about 2·5W with a 4Ω load.

The bias from the half-rail potential divider is connected to the 'bottom end' of the volume control RV1, whose slider is connected to the non-inverting input of the chip. The audio signal is connected via C2 to the 'top end' of RV1. R5, R3 and C3 form the feedback network, with 100 per cent DC feedback and AC feedback that determines the voltage gain – at mid-audio frequencies this is determined by (R3 + R5)/R3. R6 and C5 form the familiar Zobel network. C6 blocks DC at the output, while R7 enables C6 to charge when there is no connection to a speaker, avoiding a loud 'plop' should a speaker subsequently be connected. R4 and C4 decouple heavier current changes that could possibly modulate the 12V supply.

Note that the half-rail voltage is also used to disable the AFC action, via SW1 (see Fig. 1). Thus R1 and R2

(Fig. 3) must be retained, to retain AFC switching, should you decide not to fit the audio module. In this case there would be no need to use C1.

FM Module

The FM module proved to be an interesting part of the project. I decided to buy a Velleman P1771 module and modify it as required. The original circuit is shown in Fig. 4. This Belgian module was designed as a small transmitter or use in applications such as baby alarms. It is illegal to use it in this way in the UK. Velleman claims very good frequency stability and, subject to the changes to be described, I agree with this. Unfortunately the modulator design is not very good and needs modification.

When I first tested the module I found that its audio output was noticeably distorted. Presumably this does not matter with a baby alarm, but it is unacceptable for our application. A look at the circuit revealed where the problem lay. Varicap diode D1 is the modulator. The modulating input is applied via R2, D1's capacitance changes being linked to the oscillator circuit via C1. The problem is that D1 has no fixed reverse bias, which means that its bias has to be obtained by rectification of both the oscillator signal fed back to it via C1 and the audio signal fed to it via C8 and R2. Furthermore there is no DC return path for the diode, so whatever charge builds up on C8, a 4·7µF capacitor, can remain for an indefinite period. Ironically this can arbitrarily change the varicap diode's bias and thus the oscillator's centre frequency, undoing the efforts made to achieve good frequency stability. If the baby cries loudly, the transmission will move up the dial!

With this application we don't need a large audio gain, so the microphone input circuit can be modified. We do need pre-emphasis, which is another part of the modification. Fig. 5 shows the modified circuit. The original component numbers have been retained: new ones have been given a letter suffix so that they can be readily identified. Some of the component values have to be changed – a list is provided in Table 2.

Now for a detailed look at the modifications. First the modulator circuit. RA and RB are added: RB provides a return path to chassis, while RA provides D1 with reverse bias. As the 12V supply is stabilised, there is no need to stabilise the varicap diode's bias separately.

Secondly the audio input circuit. This is modified to become a simple emitter-follower. Tr2 is deleted, the audio input being fed via R6 to the base of Tr3, which is symmetrically biased between 12V and 0V. CA provides the pre-emphasis required. R4 is adjusted to provide 250mV peak-to-peak at its slider. The reason I can state this confidently is the result of an unusual piece of luck. No, a good fairy didn't leave some exotic piece of Hewlett-Packard FM test equipment on my doorstep overnight! When transmitting its 'Graphics Channel' my local RSL station TV12 rebroadcasts Wave 105 FM, a local station, as the sound channel. So, to determine when I had the correct deviation I first tuned my FM receiver to Wave 105 and measured the peak-to-peak audio output, then retuned to the output from the FM module and adjusted R4 for the same peak-to-peak signal (while the same awful record was being played!).

Having carried out these modifications successfully I decided, realising that I must not broadcast to the surrounding neighbourhood, to check the signal radiated from the FM PCB. Every receiver in the house could pick it up. I then wandered off to the garage at the bottom of the garden and discovered that a good-quality signal could also be picked up on my car radio. I drove off and discovered that I could travel nearly a quarter of a mile before the signal faded out!

Table 1: Signal input indication metered at pins 1 and 4 of SK2.

Signal input	*Metered voltage*
0dB	3·25V
–6dB	2·4V
–12dB	1·75V
–18dB	1·32V
–24dB	0·65V
No input	0·005V

To reduce its radiation to an acceptable level I enclosed the FM module in a screening box and added a filter in its 12V supply, the aim being to reduce the radiation to the same level as that of the local oscillator in an FM radio. The screening box solved the problem. Mechanical details of this and other constructional aspects will be provided in Part 2 next month. Note that SW2 (Fig. 1) is included to switch off the FM output when this is not required. L1 and C6 decouple the module's supply as far as RF is concerned.

LED D3 provides FM-on indication. R7 (inside the screening box) and R8 (outside the box) form an RF attenuator. The FM signal can be taken from SK4 to the aerial connection of an FM tuner etc.

The use of printed inductors and an FET oscillator (Tr1), plus the modifications to the modulator circuit, ensure that this module has surprisingly good frequency stability despite the absence of crystal control. The use of stable, fixed bias for the varicap diode enables the working point to be set at a more linear point on its characteristic: this considerably reduces the audio distortion in comparison with that introduced by the original circuit.

Next month

This completes the technical description of the unit, what it does and the options you can choose if you don't want all the facilities possible. In Part 2 next month recommendations on construction will be provided along with layout information, details of how to implement the modifications required to the power supply and Velleman modules, setting-up instructions and component lists.

Table 2: Modifications to the Velleman FM transmitter module.

Component	*Modification*
Tr2	Omitted. Link out as shown in layout diagram next month
RA	Added, 10MΩ
RB	Added, 1MΩ
CA	Added, 470pF, in parallel with R6
C7	Deleted
C8	Value changed from 4·7µF to 0·1µF
C9	Deleted
R5	Value changed from 1kΩ to 100kΩ and top end rewired to the 12V line
R6	Value changed from 56kΩ to 100kΩ
R7	Value changed from 1MΩ to 100kΩ
R8	Deleted – replaced with a link

HELP WANTED

The help wanted column is intended to assist readers who require a part, circuit etc. that's not generally available. Requests are published at the discretion of the editor. Send them to the editorial department – do not write to or phone the advertisement department about this feature.

Wanted: Line and field timebase panel for the Ferguson 8500 chassis. Les Mawdsley, One Way TV, 82 Sandhurst Road, Rainhill, Merseyside L35 8NQ. 0151 426 4152.
Wanted: Complete working PCB for the Sanyo Model CBP3024 (A3-A14 chassis). It's a 14in. colour portable. M. Payne, 66 Nevinson Avenue, South Shields, Tyne and Wear NE34 8MP. 0191 537 2062.
For disposal: *Television* magazines from 1967-1998 complete; *Radio and Television Servicing* books from 1969-1988; *U-View TV and Video Servicing* books from 1988 onwards. Many TV, audio and video manuals (many originals, some photocopies) from early Eighties to early Nineties. And a B&K 467 CRT restorer with approximately ten bases, in mint condition – hardly used. CRTs, spares, etc. Steve Cain, Chippenham, Wilts. Please phone 01249 445 069 for complete list or alternatively e-mail stevecain@btinternet.com
Wanted: I have a number of transformers type AT2048/11, lot 317. Does anyone know what they were intended for and any equipment makes/models? The Granada catalogue lists the numbers but doesn't specify applications. Please phone Roy Bailey on 01705 783 811.
Wanted: Picture-in-picture module for the B&O LX6000, new or second-hand. David East, 189 Green Lanes, Wylde Green, Sutton Coldfield, W. Midlands B73 5LX. Phone 0121 354 2189 after 6 p.m. or e-mail DMEast@aol.com
Wanted/for disposal/sale: Require an MC1305 stereo decoder IC for the Quad FM3 tuner. Have for disposal (free for collection) a 3ft high pile of TV, audio and video manuals, mainly from the 60s/70s; a Luxor reel-to-reel tape recorder, complete untested; and a box of radio/TV valves. The following are for sale: A Unaohm EP684 colour-bar generator, with manual, working £20. An early AVO LCR bridge, working £10. Over thirty early DS and SS CTV, video and camera manuals (including BRC 2000 chassis and the Philips N1500 and N1702 VCRs). Send SAE or e-mail for complete list. £5 each, £100 the lot. Buyer collects. Mike Phelan, 21 St Barnabas Road, Hightown, Liversedge, W. Yorkshire WF15 8BS. 01274 870 872. E-mail mike@lean.co.uk
Wanted: Does anyone know where Betamax VCR videotapes can be bought? J.H. Heath, Mallorca, Baileys Drove, Wool, Wareham, Dorset BH20 6EP. 01929 462 262.
Wanted: New or used heads for a Denon DTR2000 DAT recorder. Must be cheap and in full working order. Lee Archer. Phone 01942 714 268 or e-mail heads@room909.co.uk
Wanted: Working tuner-timer panel for the Ferguson Videostar 3V31, or a scrap unit. Panel no. is TT/CTL PWB ASS'Y 07 PU10432. Also require a retro-fit Nicam panel and cableform for the Ferguson TX10 stereo-text TV Model 37063, or a scrap set considered. Please phone with price etc. Can collect in the Blackpool area. A. Clifford, 01253 697 460.
Wanted/for disposal: Require a tuner unit for the Ferguson 2000 colour TV chassis. Have for disposal several modern VCRs, for repair or spares. Some centre-load, all complete. Mick Gee, 01702 558 444.
Wanted/for sale: Require a scrap Salora 1M chassis with good CCU chip. Have for sale a Primax TA901 CRT regenerator, boxed with eight adaptors and manuals, £145 ono. Also 250 plus TV/VCR/sat/audio manuals - e-mail for list/prices. Vince Buffin, 01752 215 536 or e-mail vinceboo@niffub.freeserve.co.uk
Wanted: Remote control unit for the Samsung VCR Model SI3260. N.A.B. Plumb, 58 Howell Road, Exeter EX4 4EY. 01392 277 444.
Wanted: Cassette lift mechanism, complete assembly, for the Sharp VCR Model VC381. Also circuit details to reduce station drift with the *Wireless World* Nelson-Jones FM tuner. Can collect. P. Rosbottom, 24 Avon Road, Morley Hall, Wigan, Lancs. 01942 703 843.
Wanted: Service information and/or a circuit diagram for the Peerless Model 580 automotive diagnostic oscilloscope (circa 1982), photocopies OK. Eric Kempshall, 109A Portland Road, Hove, E. Sussex BN3 5DP. 01273 382 001.
Wanted: LOPT for a 5in. Orion colour TV, or a faulty TV or an equivalent unit with working LOPT. Also require a power supply for the Sony Beta VCR Model SLC9UB, or a faulty machine with working power supply. Contact Kash on 0121 602 3993 or e-mail kash@punjab.fsbusiness.co.uk
Wanted: User instruction book (photocopy OK) for the Pye VCR Model DV292 (or Philips AV6290). Also require a complete, working timer PCB (part no. 215B37501) for the Mitsubishi HSB11 (or HSB21) VCR. W. Coates, 86 Brentwood Park, Belfast BT5 7LR. 01232 798 984.
Wanted: Modification details to remove teletext lines from the top of the raster displayed by a Sony KV1340UB colour portable with two-IC decoder board B. D.H. Kidston, 102 Fergus Avenue, Livingston EH54 6BG. 01506 433 371.
Wanted: Sony camcorder Model CCDV900E for parts. I'm not looking for a serviceable one: what I need is the camera section. If that is OK, it would suit my purposes. Bill Davies, 18 Black Bridge, Holyhead, Anglesey LL65 2BU. 01407 762 400.
Wanted: Power supply and remote head cover for the Brenell Mini L8 8-track recorder. Also a circuit diagram for the B&K 467 CRT restorer/analyser. V. Smith, 175 Lyon Park Avenue, Wembley, Middx HA0 4HD. 0181 902 5447.
Wanted: Operating instructions for the Xerox 645 typewriter/word processor, also an 'instruction disc' for this machine. I can copy and return data. E. Roberts, 62 Hay Street, Perth PH1 5HS. 01738 622 755.
Wanted: LOPT (Murata MHF042-03 6Y06) for the 22in. Murphy Model M22S01 (ZX4200 chassis). C.M.

Continued on page 307

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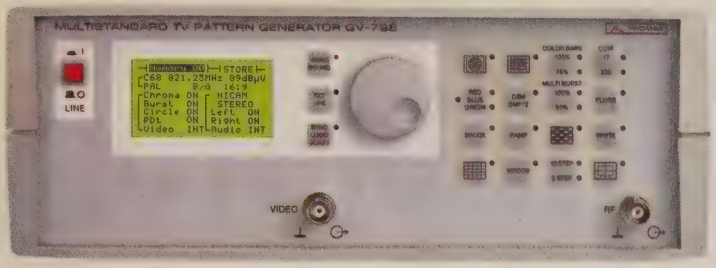

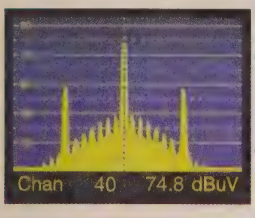

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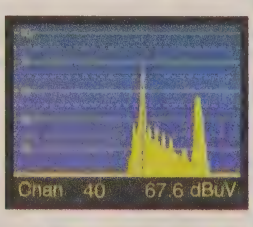

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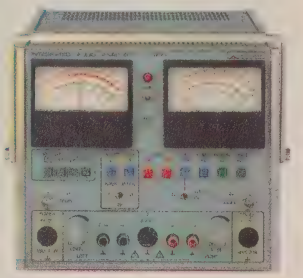

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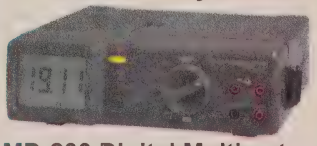

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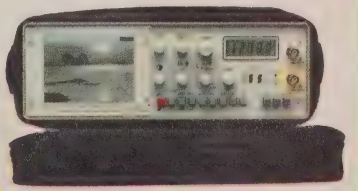

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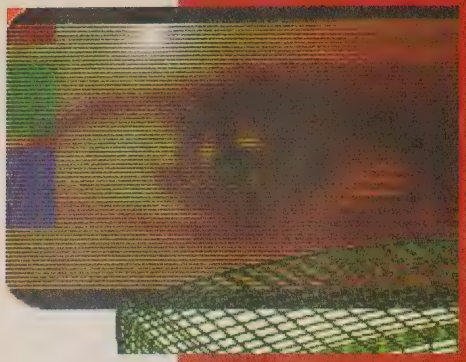

Monitors

Fault reports from Ian Field

Elonex MN034P

The complaint was "stuck in standby until knocked on the side". As usual, it's not possible to tell from the model number what's inside. This one had a Philips chassis. I thought the P suffix might indicate this, but the next MN034P I picked up looked like an Amstrad model! This version of the Philips chassis has two TO220 devices clipped to the rear metal bracket. One is a MOSFET and the other a three-terminal regulator. The MOSFET's soldering should always be checked, as arcing here can cause a lot of damage.

Both TO220 devices had fine cracks in their soldered joints. The MOSFET is connected to a small driver transformer and a larger energy-storage inductor, both of which needed fresh solder. After attending to this and, as a precaution, a quick trawl around the rest of the PCB the monitor worked first time every time – without any need to hit it!

AST Vision 4I (CMC1418AD)

The 3·15AT fuse had blown, but no obvious short-circuit could be found. The regulator is an STR59041: this device and this type of fault seem to go together! Before condemning it however it's always worth checking the electrolytic capacitors in this area. C613 and C614, which are both 22µF, 50V, each produced an ESR reading of about 2Ω. C614 is the regulator's error voltage reservoir capacitor. C613 is something to do with T602, which appears to be a line-rate sync transformer. I replaced them both, and added 0·33µF, 63V non-electrolytic capacitors in parallel with them to reduce self-heating produced by ESR losses. For the initial test power up I removed the degaussing posistor and reduced the fuse rating to 2AF. As the monitor worked all right I refitted the posistor and replaced the fuse with the correct type. The monitor then survived a two-day continuous soak test followed by a day of periodic switching on and off. It has now been returned and there has been no further complaint.

Dell Vi1428EBP

The job card said dead with a loud squeak from the power supply. I found that the power supply was shutting down instantly and that there were no overloads on the secondary side. It was easy to establish this fact because the regulation system, which is based on a UC3842 chip, samples the voltage produced by the auxiliary winding on the chopper transformer – the optocoupler has nothing to do with regulation. Since none of the outputs from the rectifiers on the secondary side of the circuit are sampled for regulation purposes, it's safe to run the power supply with them all disconnected.

The cause of the shutdown was the fact that the MCR100-6 thyristor Q102 was firing and clamping pin 7 of the UC3842 chip. The voltage at the gate of this thyristor is smoothed by C110 (10µF, 50V), which produced an ESR reading of between 2-3Ω. The voltage comes, via R108 and the 18V zener diode D105, from the error voltage reservoir capacitor C108A (68µF, 25V). This produced a similarly bad ESR reading. The supply reservoir capacitor for the chip, C109 (100µF, 25V), also had an ESR of just under a couple of ohms. Once these three electrolytic capacitors had been replaced the monitor powered up normally.

Elonex MN024 (F6Y)

Care is needed with identification of the MN024. There are dozens of different versions from at least as many manufacturers! A clue is provided by the case style. The complaint with this one, an Acer model, was "shimmers". I've recently learnt to associate Elonex monitors with the need for electrode flashing to clear focus faults. But the problem this time seemed to be the result of a faulty electrolytic. The difficulty was, which one?

The only answer was to start with the electrolytic capacitors on the primary and secondary sides of the chopper power supply and work anticlockwise around the PCB, via the rear edge, until I found the culprit. Apart from most of the 10µF, 50V electrolytics, those in the power supply were all OK. Amongst the cluster of electrolytic capacitors between the cable mount and the line output stage heatsink there was C353 (1µF, 250V), whose ESR exceeded the 7Ω limit of my meter. The nearby C361 (1µF, 50V) had an ESR of greater than 2Ω. Replacing these two and the 10µF, 50V capacitors in the area concerned seemed to do the trick.

Sony CPD15SX1

The complaint was "intermittent screen distorted". There was an additional comment on the job card – "also movement when you tap the sides". This is not one of those models in which the swivel base erupts through the main PCB if you place anything heavier than a telephone directory on top of it! With a few scattered exceptions the solder joints looked perfect, so I began by attending to the few that weren't.

The small microcontroller subpanel, along the same side of the PCB as the LOPT, can be of SIM or SIP design, i.e. it may have its

own pins and be soldered in or may clip into a SIM socket. The latter can occasionally give trouble because of tarnished contact pads. Usually giving it a wiggle will solve the problem, but in stubborn cases a light rub with a fibre pen or 'soundflex' block may be required.

When the monitor was powered and fed with a peak-white test signal there was a distinctly cyan raster. When a colour-bar pattern was selected there were black bars where the red ones should have been. The cause was the cable at the "releif shroud", as it left the plug. There was a bulge in the cable between the plug and the adjacent suppression ferrite. While faulty manufacture is a possibility, I suspect that either the cable had been twisted sharply close to the plug or the base unit had been jammed back against the wall behind it, trapping the signal cable. Every once in a while you have to remind a customer that this risks cutting off the air flow to the PC's cooling fan, with the possible consequence of a written-off motherboard as well as damage to the monitor cable.

CTX CVP5468LR

The main complaint was of varying focus. The customer also wanted the width to be increased. So I set about this first – it gave me something to do while evaluating the focus problem. The usual checks for correct HT voltage setting, noisy presets and tired flyback tuning capacitors failed to reveal anything amiss, so I moved on to plan B – to add between 220-560pF across the LOPT's primary winding. If any sort of ceramic capacitor is used here, its voltage rating should be at least 8kV.

By the time that I had found the best capacitance value to add, the focus fault had put in an appearance. The symptom was consistent with what I've come to expect of a Panasonic CRT (this one was an M34KBV280X19/25). My theory is that getter residues and/or stray contaminants accumulate on the focus or screen electrode. Very often this can be cleared by 'sparking' the electrode. The safest way to do this is to fit a flylead to the focus box on the CRT base and connect this alternately between the focus output from the LOPT and chassis. In more severe cases something stronger is needed – say the pulse at the collector of the line output transistor. This one was even worse! The focus fault refused to budge until the flylead was cautiously eased under the CRT's anode cap.

This may sound to be a drastic step, but back in the days of hybrid CRT chassis most engineers would happily resort to 'brushing' the CRT pins with the arc from the detached anode lead! In these days of highly integrated semiconductor chips the procedure is not without risk. I have had a case, with a different make of monitor, where a 74LS86 mounted close to the CRT base was damaged.

But in this case the monitor's overload protection shut down the line output stage and the transient made the test PC reboot, with no damage to any of the equipment involved. It is however obviously safer to have an expendable PC with which to run monitors while this procedure is carried out!

Compaq 420

Poor contrast and uncontrollable focus were the complaints with this monitor. It's not unusual to find a tired CRT in one of these old-timers, especially the early 420 (no suffix). In comparison with more recently manufactured monitors, the video bandwidth is limited and this can be mistaken for poor focus. But the monitor had a decidedly poorly CRT. In addition several of the glued-on geometry magnets had fallen off, leaving appaling geometry. There was no hope of rejuvenating this CRT.

Fortunately there was a scrap unit in the stock room. It had been abandoned because the LOPT had failed. The monitor's original CRT was an NEC M34JUP33XX165(B), the salved replacement I fitted was an Hitachi M34JCA33X84. Although everything fitted all right, the grey-scale needed some setting up. As the presets have quite a wide adjustment range, it usually takes several goes at the cut-off and gain presets. For final adjustment, the cut-off presets need to be accurately balanced before you carry out a last gain trim.

Viglen CA1426LT

This monitor had a pink grey scale. There were dry-joints everywhere, on the main and the CRT base PCBs. Once this had been attended to I found that the CRT needed exercising. It was left for a prolonged run displaying a peak-white raster to settle the cathodes. The grey scale was then set up and the monitor given a final soak test.

Apart from having a Trinitron tube this chassis is almost identical to one of the **AST LR14** versions. The value of C322 is 5·6nF (1·6kV), but it's a resin-dipped type and is a lot bigger than the square ones that melt! The resin-dipped type has a much better reliability record – but this counts for nothing if the capacitor is not securely soldered to the PCB!

Super 4 1451CLR

The job card said that this monitor was dead. It wasn't – I heard the EHT rustle up! But only three of the CRT base pins were actually held fast to the PCB: all the others had complete fracture rings around the solder fillets. The chassis in this monitor is almost identical to the **CTX 1565D**. Presumably this 14in. model is an earlier version.

ICL-Fujitsu PC-TV Model DB10301E

In the monitor mode there was a small, unsynchronised display. TV operation seemed to be more or less all right – the picture was almost stable. Given this fault, it's surprising that the monitor section didn't blow up! Inspection revealed that the tall, ceramic 2kΩ, 10W resistor R130 in the snubber network was held in only by brown glue: perhaps the conductive nature of the glue almost replaced the resistor function?! The rest of the PCB, overall, had at least an adequate amount of solder, but it had either been applied too hot or with too little flux. The CRT panel looked very scruffy in this respect, but was OK with no need for any reworking.

Once the monitor had been restored to normal working it became apparent that the keyboard had suffered a hard life. Several keys either didn't work or did so with severe bounce. I was able to repair most of the damage by using Ecolit silver-loaded track repair paint. The keypad consists of 'tactile rubber cup contacts' on a plastic sheet, with silver-plated tracks. The interleaved contact pads are carbon coated, but can be repaired with silver-loaded paint provided care is taken to avoid short-circuits.

If a repaired contact still fails to operate correctly, try continuity checks to the edge connector. The one I was repairing had an almost invisible scratch that had severed the track leading to the escape key. This was also repaired with silver-loaded paint.

Michael Maurice's letter in our September 1999 issue initiated a detailed discussion of the current state of the consumer electronics repair trade in the UK. He takes this opportunity to summarise the situation as he sees it

State of the Trade: Summary

It has been interesting to read the responses from a number of service engineers to my letter in the September 1999 issue of *Television*. In it, I expressed my great concern about the poor prospects for the future of domestic electronics repair work. Incidentally a subsequent letter of mine on the same subject was published in the letters section of the *Daily Mail*.

The main point I wanted to emphasise is that engineers and companies will have to invest heavily in test equipment and computers if they are to be able to service future consumer electronics equipment. What concerns me is that we are likely get little if any return on such investment, especially with the sharp decline in the amount of chargeable work available. In fact the capital invested could be lost.

There will always be those who express optimism about the trade's future. They seem to be a minority. I wish them lots of luck – they'll need it. The stark reality of the situation is as follows:

Our heading photograph is a Television archive picture and is not related to the author.

(1) Since the start of SkyDigital, there has been a steep decline in the call for repairs to analogue satellite equipment. There was a small delay in this decline because Zee TV continued to use analogue transmission, so the Asian community wanted to keep their sets going. But Zee TV has now moved to digital broadcasting, so there will be very little work repairing satellite receivers.

(2) VCRs are now selling at under £70 for cheap, own-brand machines and as low as £120 for premium brands. Estimates of say £48 to repair a branded VCR are now being refused. A couple of years ago you could have charged £80, and the customer would have happily paid up! Much the same applies with most small-screen TV sets, including major brand ones.

(3) Almost every supermarket now sells TV sets and VCRs. They are the budget variety, usually Bush or Alba, but they are there right in front of you as you enter the store. You can't miss them, and they are cheap – very cheap! In fact they are cheaper than the cost of the average weekly family shopping bill.

Modern TV sets and VCRs need little if any setting up, so even this source of work has dried up. Suggest to someone that they should pay you £25 to install a newly-acquired VCR and they will think you are mad.

(4) The average person doesn't care what brand his TV set or VCR is as long as it's got a guarantee and he thinks he is safe for at least a year.

(5) There is no money to be made from digital TV. ONdigital and SkyDigital have done their best to make life very difficult for independent outlets. If you install either of these systems, especially ONdigital, you will not be paid for any callbacks. From what I have seen, the back-up service provided by SkyDigital is atrocious. Most installers are poorly trained and unhelpful.

(6) The market for refurbished or second-hand TV sets and VCRs has declined steeply. This is because the cost of new equipment is at an all-time low, and with interest-free credit, voucher schemes etc. it is very easy to buy new even if it can't be afforded at the time.

Can someone honestly say that they haven't experienced a decrease in their income from repairs? My monthly gross income from repairs has fallen by over 30 per cent in comparison with my takings for the same period in the previous year. But my bills still keep rising.

Digital TV

Chris Smith, the Minister for Culture, has announced that digital TV is here to stay and that analogue TV services will start to be shut down in about seven-eight years' time. So Colin Guy's decision not to service digital sets will mean that his work load will

decrease in the not too distant future.

It will be interesting to see the public's reaction to digital TV. While most people will accept some ghosting and slightly snowy pictures with an analogue set, they won't accept pictures breaking up into mosaics, freezing and pixilating.

Kevin Davies (letters December) expressed exactly what I had aimed to get across to the readers of the *Daily Mail* when I suggested that digital TV is being forced upon us. Digital TV either works well or doesn't work at all, with a very thin dividing line between these two conditions. To me the pictures produced by digital TV, especially with the new breed of widescreen sets, are very plastic-looking and unnatural. Provided the CRT is in good condition, most older sets give much better and more natural pictures than the new digital ones.

Digital TV doesn't provide viewers with anything like the flexibility they enjoy today. If a household has say three TV sets and two VCRs, with analogue TV members of the family can view all five terrestrial channels and/or record the five channels using timer VCRs. With digital TV you would have to replace all the sets and VCRs with new equipment. Even then you can get only one card unless you are prepared to take out several contracts. And even then broadcasters are reluctant to issue more than one card per household.

The government's interest is purely financial: income from leasing the remainder of the UHF band, together with the VAT income from the sales of new sets and subscriptions, will swell the coffers of the Exchequer.

Finally the public should be under no illusion that digital TV equipment will be easy to repair – if it can be repaired at all. This has even been admitted by a major manufacturer, so what chance do we have?

A dying trade

Ours is a diminishing and dying trade. No other one is going down the pan so rapidly. Plumbing, building, car repairs, decorating and most other trades are all providing steady work, and in these trades charges can be increased. We cannot do this. Most garages around here charge approximately £36-£38 an hour, with main dealers charging £50-£70 an hour. You would be laughed at if you tried to make such charges for a TV, VCR or hi-fi repair.

It was said at a recent RETRA conference that the average age of TV service engineers is 46. When you consider that this is a modern hi-tech industry, and that in most trades or professions you are over the hill at 35, 46 is positively old. There are virtually no new people coming into the trade. Computer repairs are far easier and the pay is much better, so young people training as electronics technicians go into that or other areas instead.

My guess is that once the current generation of TV and VCR engineers has retired or left the trade there will be no one to take their place. It could be that in ten years' time you won't be able to get your TV set serviced. This may not matter at the cheaper end of the market, but what about the more expensive end? It might not be so easy to find £1,000 for a replacement every couple of years because there's no one to carry out repairs. These larger TV sets are also very heavy, so that two or more people are required to lift them, and possibly a larger vehicle is

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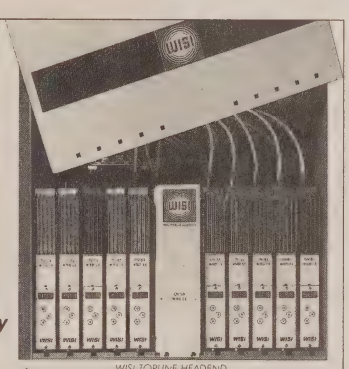

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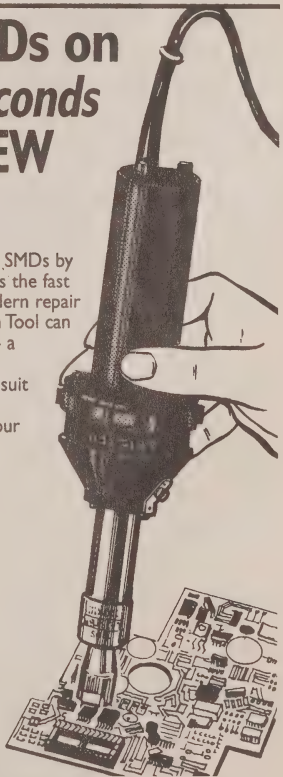

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Can anyone tell me why sets have to be so complicated and difficult to service? What was wrong with a fuse and a fusible resistor? Remember that we are talking about relatively cheap brown goods, not a new car with the latest electronically-controlled engine and control management systems. Customers simply won't pay £200 plus to have a TV set serviced.

At one time it was possible to generate a steady income from spares. You can still make some money from this. Customers often don't know the cost of parts. They often begrudge your labour charge (because you should work for nothing, like they do!), but they will pay for spares. If a well-known high-street electrical chain can charge £2 plus VAT for a resistor or a capacitor, why can't we? But many manufacturers, desperate to cut costs, have put out the supply of spares to distributors. The result has been higher prices to repairers, making it impossible for us to apply a decent mark up (if at all) to the spare parts we supply to customers as part of their repairs.

Business assessment

A friend of mine was asked by a major department store to look into setting up an independent workshop to service the VCRs that came in for repair. Apparently the need came about when SES of Dulwich closed down. My friend asked whether I was interested in setting up such a company. We both thought about it and came to the conclusion that such a business would require an investment of £50k upwards in order to secure premises, get the necessary test equipment and tools, obtain computers etc.

I told him that one would have to look well into the future. Would servicing VCRs and TV sets be feasible in five-ten years time? If a firm like SES couldn't make a go of it, why should we think we could? It might be possible if we were to gamble our savings and possibly our homes too. But what guarantees would the store providing the contract give us to make us reasonably sure that we would still be trading in say five years' time? If such a venture was successful, we could make money. If it were to fail we could lose a lot, including our homes and everything we had saved. We could be left with a property either on lease or freehold to dispose of – and empty buildings still involve substantial costs.

This added to by feeling of woe. I have reached the point, despite being prepared to work all hours to meet customers' needs, where shortage of work is causing despair, anxiety and depression. I feel it is probably time to move on, as so many have recently. My wife feels that this would be an awful waste of skills acquired the hard way over a long period of time. But what use are skills if they don't put food on the table?

I have decided to call it a day when business falls to such a level that I have to dip into my savings to pay my day-to-day bills, including mortgage, food etc. If I were to continue under these circumstances, there would be little point in the endeavour and I would lose what I have worked hard to save.

Cowboys

I have long thought that if we could get rid of the cowboys, preferably by legislation, then at least the rest of us who can repair equipment ourselves properly could earn a decent living. With this in mind I wrote to Stephen Byers and Nick Raynsford, suggesting that if they want to get rid of the "rip-off Britain" image they should consider licensing TV/video engineers in the same way that gas engineers have to be Corgi registered.

I mentioned two types of cowboys. First engineers who are incompetent and could leave equipment in a dangerous condition. Secondly the engineer who can't and doesn't carry out any repairs: he simply picks up jobs and subcontracts them to others who can and do, simply adding a mark-up to the cost of the repair when he returns the equipment to the customer. This mark-up is often over 100 per cent, sometimes up to 300 per cent. So far I have had no response.

Engineers who subcontract their work out cream off the profits, hold no spares stock, have made no investment in test gear, usually drive an old banger and, more importantly, have no responsibility except for paying the repairer's generally low bills. Even for this they usually expect a month or two's credit. If the set bounces, the repair engineer is responsible. How do such cowboys get the work? They come across as plausible and have a good line of patter with customers. To avoid being mistaken for such an operator my advertisements say "Please note that the work is all carried out by myself and none is subcontracted".

The future

If, ten years ago, someone had suggested that VCRs and TV sets would be on sale in supermarkets and cash-and-carry outlets at under £70 they would have met total disbelief. Now that it's a fact, there are despair and long faces.

For those of you who are not familiar with it Wembley, where I am based, is a large London suburb. It's the sort of place that should generate a reasonable demand for servicing work. Costs are moderately high, because of house prices and shop and industrial unit rents. There are a few local electronics retailers, also some component distributors. It should, if anywhere, be possible to run a servicing business here. But it's very tough going.

A wholesaler friend of mine confirms that a lot of engineers have given up and left the trade. So those engineers or repair organisations that can survive the next 12-18 months will have more of the market to themselves. That might give us some hope.

There is also the fact that the electronics industry has never stood still. There is always something new, with new problems, coming along. In the near future television could change beyond all recognition as electronics, computing and communications continue to converge. Who is going to sort out the fault, compatibility and interfacing problems that arise? Perhaps more to the point, who is going to be around to install and set up this equipment, and will customers be prepared to pay? I get phone calls from people who have bought cheap VCRs and TV sets from the local supermarket or superstore but can't set them up. They baulk at the prospect of having to pay me more than a tenner. So who knows? Send your answers to the editor!

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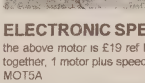

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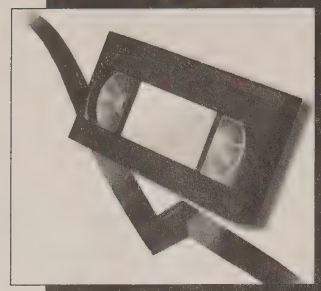


VCR Clinic

Reports from
Eugene Trundle
Kevin Green, TMIIE
Steven Leatherbarrow
Tim Edwards
John Coombes
Paul Hardy and
Michael Maurice

Akai VSG770

'Error 1' usually appeared in the display at switch on. When this didn't happen the machine worked normally for a while then shut itself down, with error 1 again appearing. The cause turned out to be switch transistor TR215, which was leaky. I've been told that zener diodes D236 and D237 can cause the same symptom with this and similar models. **E.T.**

Sony SLVE720

Two of these machines have been brought to us because of a low-gain tuner. The RF through and playback pictures were good, but E-E and off-tape pictures via the tuner were poor and grainy. In both cases the cause was a dry-joint inside the tuner/receiver module – at the front, bottom corner, farthest from the aerial socket. The PCB's earth-land solder link to the screening can tends to crack at this point. **E.T.**

JVC HRJ625

If the problem is failure to eject the cassette, with the capstan motor whirring, the cause will probably be that the spring anchorage has broken off the change arm (item 74 in the exploded view of the deck). When this happens the inject mechanism doesn't engage. In its confusion the deck laces the tape up again then shuts down. **E.T.**

Toshiba V204B

The symptom with this machine was complete lack of action and display – nothing was coming from the power supply. Only very brief pulses, at a rate of about two per second, were seen when an oscilloscope probe was connected to the collector of the chopper transistor. Normal operation was restored when capacitors CP007 (10µF, 50V) and CP008 (100µF, 25V) on the primary side of the power supply were replaced. **E.T.**

JVC HRJ665

The only response this machine produced was a very faint ticking that came from the chopper power supply. A 15V zener diode, D5301, turned out to be the cause of the trouble. It had gone short-circuit. **K.G.**

Sharp VCM301HM

The tape would load and then play for a maximum of about four minutes, after which the machine would cut out. Investigation showed that in the fault condition the drum motor stopped rotating. The cause of the trouble was the BA6977S drum driver chip IC702. **K.G.**

Sharp VCM26

There was extremely bad patterning, of the type you generally come across only with co-channel interference. But it was also present in the playback mode and with the aerial disconnected. The colour would drop out, and when present differed in hue across the screen. X501, which is associated with IC201, was the culprit. **S.L.**

Orion D9600

The upper deck of this double-deck VCR produced pictures that rolled/jumped. Adjustment seemed to be the answer, but as usual nowadays there were no presets to adjust. What you have to do is this: set the display to deck A, play back an alignment or known good tape and, while the machine is playing back, press 'tracking auto' on the handset and 'play' at the machine. If the ATR flag disappears, adjustment is complete. I found that several attempts had to be made.

If the ATR flag remains, a different procedure is required and a 'service handset' (JG155) has to be obtained. Fortunately I didn't have to go that far with this machine. The manufacturer could of course have fitted a potentiometer or two, saving the cost of a manual (about £20) and a two-week wait. **S.L.**

Daewoo V200

This supermarket special uses a Sony power supply module that's in a neat little can. It is common for C53 (1µF, 100V) to dry out, the result being a dead machine. **S.L.**

Akura VX160

There was a very intermittent fault with this machine: the playback FM signal would disappear at random, but never for long enough to enable fault tracing to be undertaken. I eventually found that the LA7376 FM amplifier chip in the can behind the drum was heat sensitive. A replacement cured the fault. **S.L.**

Ferguson FV71LV

The customer complained about poor start-up, intermittent play and jumping to rewind etc. of its own accord. This looked like power supply trouble. So I replaced CP07 (10µF, 50V) and CP08 (100µF, 50V). When DP06 (BYV10-20) was tested I obtained a reading of 300Ω. I replaced it with a BYD33D. On the secondary side of the circuit I noticed that there was an 85°C axial capacitor in position CP41 (220µF, 25V). So this was replaced with the correct radial 105°C type. I also replaced CP71 (10µF, 50V) on the print side as

this can also cause problems.

When I refitted the power supply and switched on I found that a cassette could be loaded but would not play properly, and there was no eject. To cut a long story short, by running the machine out of its case I found that everything was working correctly. So where were the strange commands coming from? The base screws were too long. The one on the side of the play button was touching the soldered pins (track side) of connector BC06. **T.E.**

Hitachi VTM230

The complaint with this machine was about tape chewing, which to start with was very intermittent. After a long soak test however it was obvious what was responsible for the tape damage. The pinch roller was faulty, not because of wear but because the retainer plastic insert that holds the roller to the arm assembly had split. As a result the pinch roller slowly moved down the shaft and the tape was then incorrectly positioned. **J.C.**

Toshiba V212

There was an unusual fault with this machine. When it was in the playback mode it produced an E-E picture! The cause was the MC1409 shift register chip IW20. The only reliable check is by substitution. **J.C.**

Samsung SV421K

If there is tape damage when the tape is running, check the pinch roller for wear. If there is damage when the tape is ejected, check the left-hand brake assembly. It can wear to cause this trouble. **J.C.**

Akai VSG745

We've had two different faults with this model recently, both caused by a defective mode switch. The problem with the first machine was intermittent fast forward and rewind. With the second machine there was tape damage at eject, because a loop of tape was being left out of the cassette. **J.C.**

Philips VR522

A number of power supply capacitors can cause the no results symptom with this machine. In this case the culprit was C2112 (100µF), which had fallen in value to just 7µF. **J.C.**

Sony SLV625

The original problem was tape damage because of a sticking limit post. As the grease had hardened, the post didn't return to its correct position. The arm had to be removed, cleaned and regreased. I gave the machine a good clean and replaced the head-cleaning roller. One problem remained after this: there was a slight, very strange knocking noise. The cause was traced to the timing belt, which had stretched. **P.H.**

Mitsubishi HSM40V (J deck)

A tape was jammed in this machine. I unloaded it manually then removed the cassette lift assembly for inspection. The cause of the problem was that the peg was out of engagement with the spring at the right-hand side of the cassette. As no other damage was apparent, I retimed the mechanism and tried it with another tape. Everything was fine, but the machine failed when the customer's tape was tried. I had to retime it again. The cause of the problem was the customer's cassette. **P.H.**

Panasonic NVF65

"Poor signals" it said on the job card. When I tested the machine I found that it would search for channels but wouldn't stop at a signal. In addition interference could be seen on the received picture as the transmission was tuned through. The cause of the trouble was hash on the 45V supply because C1118 was open-circuit. The other power supply lines were OK. **P.H.**

Ferguson FV81LV

This machine wouldn't accept a cassette. The cause of the trouble was the small lever that actuates the cassette flap lock – it was missing. I couldn't find it in the machine, and it's not available separately. Although the Willow Vale catalogue has an exploded view of the L mechanism, the cassette holder (item 16) is not shown in the parts list. It is however available under WVE order code 20081HC. **P.H.**

Mitsubishi HSM37B

This machine was jammed in the fully-loaded state. I released it by turning the loading motor, after which the fault wouldn't recur. So I stripped out the pinch roller and pinch cam helter-skelter gear and then thoroughly regreased all the moving parts. A few weeks later I was called back. This time eject was difficult, also going into play and record. The cause was the grease around the idler: it had gone hard and sticky. I had to strip down both plates on the underside of the mechanism and regrease all the bearings and pivots. If you fit the pinch-roller kit, new grease comes with it. This information will apply to other models that use the same mechanism. **M.M.**

Sanyo VHR190E

There was either intermittent or no remote control operation. The cause was dry-joints at the connectors that link the two front-panel PCBs. Resoldering provided a complete cure. **M.M.**

Sony SLV625

A couple of weeks after replacing the pinch roller and regreasing the half-load arm I was called back because there was no record/E-E sound. Connector CN0306 on the Nicam module was dry-jointed at nearly every pin that links it to the main PCB. **M.M.**

Sharp VCA55HM

Rewind and fast forward were OK, but play was either very slow or not at all. For a change the capstan motor was running freely. It had failed electrically, a replacement restoring normal operation. **M.M.**

JVC HRJ600

This machine wouldn't eject a cassette fully. JVC's excellent technical department told me the cause is the pin, on the main deck, that acts as a bearing for the relay arm and gear, and that the only cure is to replace the main deck chassis, part no. PQ11473B-4. The main deck comes as a bare chassis, so every part from the old one has to be removed and transferred to the new one – 105 parts excluding the drum assembly. Be prepared to spend a few hours doing this.

After reassembly and testing I found that there was a fault with the brakes. They didn't come on when stop or play was selected after rewind or fast forward. The cause was misalignment between the sliding base (item no. 151) and the control cam. So I replaced this, the slide plate and main brakes. But the brakes still didn't come on after fast forward. To cut a long story short, I found the cause to be lack of grease on the new slide plate. I also had to replace the slide plate's spring. The machine then worked correctly.

Next time I'll make sure I charge a lot more for my time! **M.M.**

WCES Las Vegas Show report

The US Consumer Electronics Shows are the world's leading events for the display of new systems and products. This Winter's one was no exception. George Cole reports

This year's Winter Consumer Electronics Show (WCES 2000) at Las Vegas provided more evidence of the convergence between computer and consumer electronics technology. Not only was the show dominated by computer companies such as Microsoft: in addition, the traditional consumer electronics companies devoted much time to presenting and promoting PC-relevant products such as hard-disk recorders and solid-state recording devices.

HDTV

The USA has adopted a high-definition digital terrestrial television standard known as ATSC (Advanced Television Standards Committee). It's actually a comprehensive system that offers both standard- and high-definition (1,018 lines) modes, with Dolby Digital (AC-3) audio. There are in fact no fewer than eighteen variations to the standard, with digital receivers able to offer different line standards, a 16:9 or 4:3 aspect ratio, 30 or 60 frames per second for video-based material, 24 or 30 frames per second for film-based material and either interlaced or progressive scanning. There are also many 'digital-ready' receivers that can be connected to a digital TV decoder.

Initial ATSC HDTV transmissions started in 1998, and it was expected that coverage would extend to fifty per cent of households by the end of 1999. The Federal Communications Commission (FCC) has set an analogue switch-off date of 2006, but few now expect that this will happen. The ATSC system has been dogged by difficulties, including high receiver prices (sets cost thousands of dollars) and technical problems that have marred picture quality.

Another problem emerged at WCES 2000. There is at present no standard for connecting digital TV sets to cable systems. FCC chairman William Kennard, speaking at the Show, said that his agency was ready to intervene if the two sides cannot come to an agreement. Fourteen of the largest consumer electronics companies met at the WCES to try to establish a technical standard for digital cable connection. There is also the issue of copy protection. The Consumer Electronics Association (CEA), which represents the main receiver manufacturers, expressed the hope that the cable and content industries would soon be able to remove the final barriers to compatibility and copy protection. There have also been digital terrestrial TV reception problems, which were mentioned in our leader last month (page 195). The CEA says that DTV sales reached 120,000 units by the end of 1999.

Despite all this, many HDTV sets were on show. Thomson Multimedia's Model F3810 is a 38in. direct-view HDTV set that sells for just under $4,000 (£2,700). The Proscan widescreen Model PS3000 also has a 38in. screen. Thomson was demonstrating a 61in. HDTV projection TV, Model PS65000. There were also HDTV set-top receivers for use with analogue TV sets, providing composite video, S-video and RF connections.

The Sharp Model LC-PD50U has a 50in. HDTV plasma display that's just four inches deep with a 16:9 aspect ratio. It has an RS232 interface and can display PC signals, offering XGA, SVGA and VGA viewing modes. The Sharp Model LC-28HD1 has a 28in. liquid-crystal display (LCD), while Model 34N-WF5H is a Pure Flat HDTV-ready TV with a 34in. screen and a Double Format Converter that enables video to be viewed in standard-definition (480 lines) or HDTV (1,081 lines) modes with

remote-control selection.

The Sony Models KDP-53XBR500 and KDP-61XBR500 are 53in. and 61in. HDTV sets. Panasonic showed a wide range of TV receivers, ranging from a 9in. portable to a 65in. digital projection TV set, and highlighted its Tau Pure Flat television sets. Sanyo had a display with a difference: a 3D one that doesn't require the viewer to wear glasses. This display has a resolution of 1,280 x 1,024 and has been shown at various trade shows around the world. It looks pretty impressive. Until now Sanyo has been reluctant to say when it would go on sale, but at WCES it was announced that there would be a US launch this summer. There may also be an 18in. version.

At the other extreme Samsung showed the world's first wrist-watch TV!

Hard-disk recording systems

US consumers have for some time been able to use a new type of domestic video recording device. Known variously as hard-disk recorders, digital video recorders, virtual set-top boxes and personal video recorders (PVRs), they record TV programmes on a computer hard disk rather than video tape. But they can do more than simply record video on a disk. As a programme is being recorded, it can also be streamed off, enabling the user to pause, slow-motion or replay live TV broadcasts. If you are watching a programme and the telephone rings, you just press the pause button, take the call then return to the spot where you left off. This is possible because in the pause mode the PVR continues to record the programme. You can fast-forward to the real-time part of the programme.

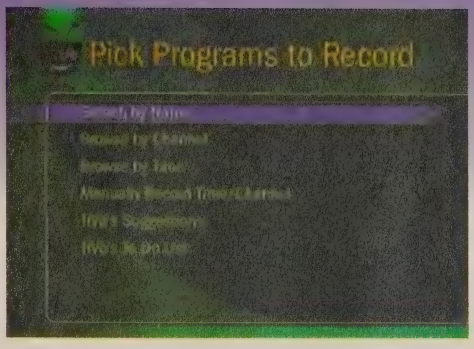
A PVR can 'learn' what types of programmes you like to watch then automatically record them. It can even suggest programmes you might want to watch! The PVR became feasible because of the falling cost of hard-disk technology, cheaper MPEG-2 video compression encoder and decoder chips, and smart software for producing programme data. The programme data is used by the PVR to identify various types of programmes such as films and sports events.

It takes about 1-2 Gbytes of hard-disk space to store an hour of MPEG-2 video. Most PVRs have hard-disk capacities of 15-30Gbytes per disk. This is expected to increase to 100Gbytes by 2002 and one terabyte (1,000Gbytes) by 2006.

There have been various difficulties to overcome in the development of hard-disk recorders. One potential problem was the noise created by a whirring hard disk. Another is the heat generated: this has to be solved either by heat dissipation or including a silent fan. Arranging the data on the disk so that it can be stored and played back simultaneously is also difficult. As data is continually being stored and deleted, fragmentation (whereby data files get scattered all over the disk, slowing operations) increases. Contrary to popular belief, hard-disk crashes are not a big problem.

Various companies and groups of companies are developing PVRs and other hard-disk based systems, including Microsoft with its WebTV system, C-Cube Microsystems and Western Digital, Sony and CableVision Systems, Nokia, Pioneer, Pace, Telewest and NDS.

The best-known PVR, TiVo, was out in force at WCES. TiVo has attracted much interest and many partners, including Sony, Philips and DirectTV, the leading US digital satellite broadcaster. A TiVo looks like a video recorder. It plugs into a TV set and a telephone line: the latter provides a two-way link between the viewer and advertisers and enables programme data and software upgrades to be downloaded to the TiVo box. It can also be linked to a VCR for archiving.



The TiVo record selection menu.

Inside a TiVo box a PowerPC processor runs with a Linux operating system. TiVo cannot at present be used with Dolby AC-3 (it does operate with Dolby Pro-Logic) or for HDTV pictures, though future versions may do so. Philips markets two TiVo products in the USA, the HRD112 which provides up to fourteen hours of recording time and the HRD312 that provides thirty hours. Their prices are $499 (about £330) and $999 (about £690) respectively. TiVo users also pay a monthly subscription of $9.99 (£7) for receiving the programme services that enable TiVo to provide a variety of smart features.

One of these enables the user to indicate the types of programmes of personal interest by using a thumbs-up button on the remote control unit. This enables TiVo to 'learn' say that a viewer likes watching football programmes. A new feature, WishList, uses word combinations to search for programmes. Enter the words 'Indian' and 'travel' for example and TiVo will look for programmes that match the preference and automatically record them. The German media company Kirch has signed an agreement with TiVo and Philips for the technology to be incorporated in the company's next generation of digital set-top boxes.

Sony announced its first PVR, which it refers to as a

Below: A group of Sony products that use the company's Memory Stick solid-state storage system.

Top photo: Sony's Model DCM-M1 MD Discamc.
Lower photo: Sharp's VN-E21U internet viewcam.

digital network recorder, at WCES. Known as Model SVR2000, it has a 30Gbyte hard-disk that provides up to thirty hours of video or nine hours in the highest-quality setting (DVD-Video). It's due to go on sale in April, selling at about $400 (£270).

Sharp uses another PVR system, ReplayTV. This provides similar features to TiVo though the service comes free.

DVD

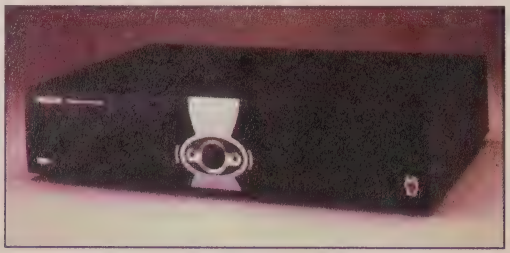
DVD has been officially declared to be the most successful consumer product launch ever in the USA. More than five million players have been sold since the launch in 1997. Hardware shipments are expected to reach eight million units this year, with household coverage exceeding ten per cent. There are currently some seventy DVD player models on sale in the USA, with thirty brands offering them. The average price is now $298 (£198), some models selling for less than $200 (£133).

The Panasonic DVD-H1000 is a progressive-scan DVD player that can also be used with CD and CD-Video discs. No launch date has been announced however. The Aiwa XR-DV526 is an audio system with a three-disc DVD changer while the company's VX-F20DV1 is a combined 20in. flat-screen TV and DVD changer unit.

Philips demonstrated its DVD+RW recordable DVD format, which is aimed at the consumer market. The discs have a 4·7Gbyte capacity and use phase-change technology to record the signals. Philips claims that DVD+RW, unlike other recordable systems under development, is compatible with DVD-Video players. More recently Philips has suggested that the format is compatible with 70-80 per cent of existing DVD players.

Pioneer was demonstrating its DVD-RW format, which the company says will offer two recording modes. The linear mode will be compatible with current DVD players; the other mode, which enables video recordings to be edited and shifted, will not be compatible.

Below: A Philips TiVo PVR.



VCRs and camcorders

VCRs took a back seat at this year's WCES. Panasonic however showed machines that use two systems, VCR Plus+ (Video Plus in the UK) Silver and VCR Plus+ Gold. The former automatically sets up the VCR by tuning into the channels available in the area. Users simply enter their post code. The latter adds cable and satellite box control.

Sony announced a Digital-8 Handycam that uses its Memory Stick solid-state storage system for capturing still images digitally. Four of Sony's new models to be introduced this spring will offer Memory Stick recording. More on the Memory Stick below. Sony also showed the DCR-TVR820, the first camcorder to have a built-in printer – it prints out business-card sized images that can be taken from tape or a Memory Stick. In addition there was the Sony MD Discam, which stores video on a MiniDisc.

Panasonic showed a digital camcorder that has three possible ways of being linked to a PC: via an IEEE 1394 link, an RS232 connector or a Card Link that uses an 8Mbyte memory card. Sharp's Internet Viewcam can be used to send video clips via the internet.

Satellite broadcasting

Digital satellite broadcaster DirectTV now has over eight million subscribers. The company showed a digital satellite receiver that includes the TiVo video recording system. It can store up to thirty hours of video.

Rival service provider Echostar unveiled the world's first DVD/satellite TV receiver, which is known as the Dish DVD. It has a 500-channel tuner, Dolby Digital audio and a multi-function remote control system. There was also the Dish HD, a high-definition satellite TV receiver that will be available in the second half of 2000, selling for about $500 (£330). Echostar says it now has 3·4 million subscribers.

IEEE 1394

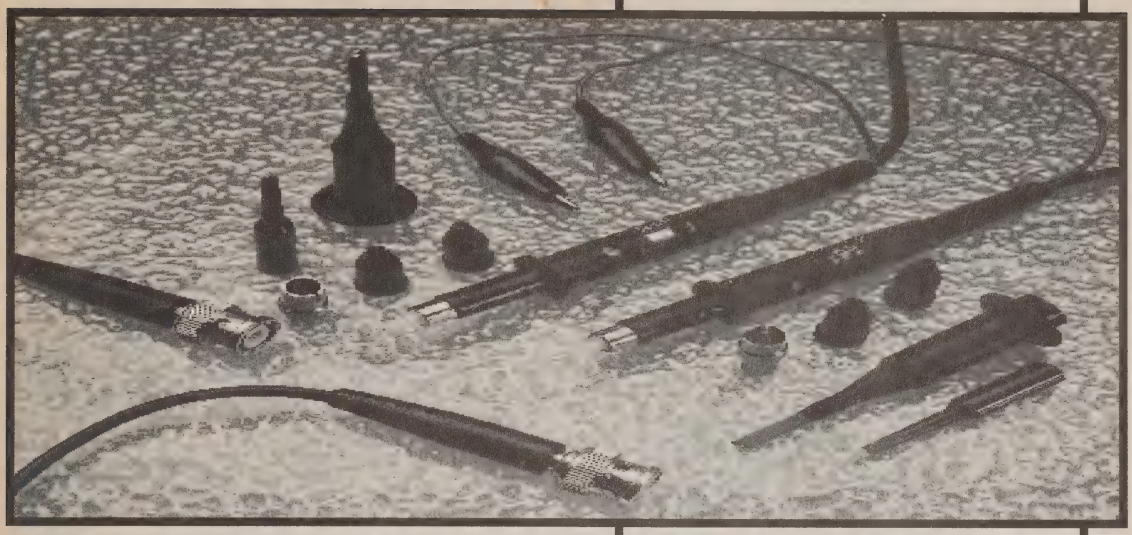
The IEEE 1394 (FireWire) trade association was present at WCES. It has been set up to promote this high-speed digital link, which is included with almost forty per cent of the PCs sold in the USA and with MiniDV and Digital-8 camcorders. A new standard, 1394b, is being developed: it offers data speeds of up to 800Mbits/sec.

A number of consumer electronics products that feature IEEE 1394 were on show, including several prototypes from Kenwood. These consisted of DVD players, AV receivers, CD players and MiniDisc recorders.

Solid-state storage

Tape is not dead, but the message from the WCES was that more and more consumer products will use solid-state technology for storing audio, digital still images and, eventually, video. Sony's Memory Stick is about the size of a stick of chewing gum. Current versions offer storage capabilities of 8, 16, 32 and 64Mbytes: versions offering 128 and 156Mbytes and 1Gbyte capability are under development. Sony Memory Stick products include a portable music server and a video viewer.

Companies such as Thomson Multimedia and Philips displayed MP3 audio players that can be used to download audio files from the internet and store them on a SmartMedia memory card.



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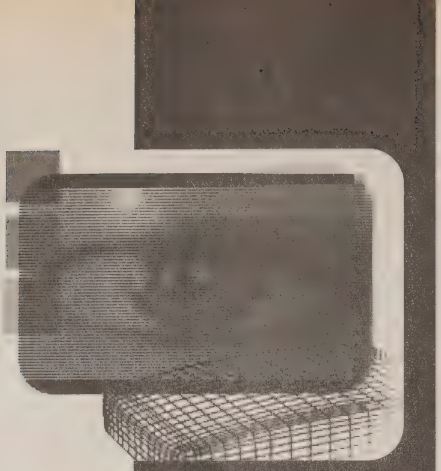
Input capacitance	40pF+oscilloscope capacitance
Working voltage	600V DC or pk-pk AC
Switch position 2	
Bandwidth	DC to 150MHz
Rise time	2.4ns
Input resistance	10MΩ ±1% if oscilloscope i/p is 1MΩ
Input capacitance	12pF if oscilloscope i/p is 20pF
Compensation range	10-60pF
Working voltage	600V DC or pk-pk AC

Switch position 'Ref'
Probe tip grounded via 9MΩ, scope i/p grounded



TV Fault Finding

Reports from
Colin J. Guy
Gerry Mumford
Kevin Green, TMIIE
Graham Colebourn
Steve Hague
Derek Bogiscin
Ian Field and
Pete Gurney, LCGI

Sharp DV5161H (4BSA chassis)

This set was supposed to be dead, but its power supply was running normally. The cause of the fault was the 5V regulator transistor Q1010 (BC338) which provides the 5V supply for various items including the MC44006 colour decoder/timebase generator chip IC801. It was leaky, producing a low output (4V). **C.J.G.**

Hitachi TN Series

I have had several of these sets recently with various faults, including failure of the field output chip and power supply blow ups. In each case the caption "C 46 TN" was displayed after the repair. To remove this, using the original handset, press both record buttons, switch the set to standby then disconnect from the mains supply. Reconnect the set and start it up in the usual way. Does anyone know why this happens? I am assured by owners that the caption was not present before the fault occurred. **C.J.G.**

Philips 21PT165B (AA5 AB chassis)

This set made a squeal as it attempted to start then went to standby. The microcontroller chip responded to remote control operation, indicated by flashing from the LED. After eliminating many things I replaced the expensive TDA8361 jungle chip (IC7015). At switch on there was a spark from the side of the LOPT then the new chip died. With a new LOPT and another TDA8361 chip fitted I found that there was a green raster. T7275 (BF422) on the CRT base panel had to be replaced as well. **C.J.G.**

Sony KV2705

When there is no EW correction with these sets the usual cause is the gate-controlled switch Q802. Not this time however. R567 (82kΩ) was open-circuit. **C.J.G.**

NEI E2591TFXN (CE25 chassis)

This newish and, for NEI, quite nicely made set was dead with an audibly pulsing power supply. The mains bridge rectifier's 220µF, 400V reservoir capacitor was open-circuit. **C.J.G.**

Ferguson 59P7A (ICC5 chassis)

This set appeared to be stone dead though a slight rasping noise came from the power supply. The source of this noise was arcing across bad dry-joints at the large wirewound resistor RP23 in the chopper transistor's snubber network. After cleaning and resoldering this and many other poor joints littered throughout the power supply and the line, field and EW stages I switched on again. This time the set came on but just blinked its LED once.

There was no drive at the base of the line output transistor TL31 nor at the collector of the driver transistor TL29. There was a healthy squarewave at the base of TL29, but it was held off because the 1N4148 clamp diode DL28 was open-circuit. **G.M.**

Sony KVX2162U (AE2 chassis)

This set was stuck in standby. The front LEDs blinked eleven times, which indicates a teletext bus error. I found dry-joints at the regulators IC683 and IC684 on board A however: dealing with these cured the fault. The usual dry-joints at the audio and field chips had previously been resoldered.

The set then came on, but there was no line sync. Adjusting RV506 (line frequency) on board M locked the picture, but not teletext or major on-screen displays. The minor channel number display was missing altogether. Some time was spent probing around until a dry-joint was found at pin 24 of IC304 (CXA1587S). Once RV506 had been adjusted back again all was well. **G.M.**

Hitachi CL32WD2TAN

This set was dead. The cause was quickly traced to D706/D710 which were short-circuit. Their replacement restored the picture, but the EW correction was poor. The set produced a good display once D707 and the field output chip IC701 had been replaced. In this chassis the field output chip contains a fair proportion of the EW correction circuit. **K.G.**

Mitsubishi CT14MS1BM

There was a very nice black line down the left-hand side of the screen, i.e. the picture had shifted across to the right. The value of R571 had changed. **K.G.**

Hitachi C2976TN (A5 chassis)

The power supply would start up then the set would revert to standby, suggesting that the comprehensive protection circuit was either being triggered or was faulty. After many checks with an oscilloscope I

found that the line output protection system was in operation, the culprit being C703 (10nF) in the diode modulator circuit. **K.G.**

Matsui 21V1N (Grundig CUC7350 chassis)

This set was dead. The owner said that it had "gone phut in the bottom left-hand corner". Inside there was a Grundig chassis with the mains fuse blown apart. Two of the mains bridge rectifier diodes and the chopper MOSFET were short-circuit. I replaced all the bridge rectifier diodes, the chopper transistor and the UC3843 chopper control chip IC60030. **G.C.**

Ferguson 51L5Q (ICC5 chassis)

In this Nicam stereo version of the chassis the luminance delay line VV53 is replaced by a small subpanel (PC1272) that carries the delay line and some S-VHS switching. The subpanel is mounted on the chroma-luminance PCB by just three connecting pins, for the luminance output (top), chassis and the luminance input (bottom). If the subpanel is vibrated or flexed too much the printed track to the top pin in particular is likely to crack. The result is a loss of luminance drive and a very dark screen. **G.C.**

Bush 16-7094

When either the programme – or the volume – button on this 20in. set was pressed the on-screen display changed to 'video' and the controls locked. The keys all seemed to be scanned by the microcontroller chip, so I decided to order a replacement. When this arrived and was fitted it made no difference. The cause of the fault was a very leaky diode (D709) in the key matrix. All that was required was a new 1N4148 diode. **G.C.**

NordMende 3437

This 26in. set was dead. The internal mains fuse had blown because the lowest of the three bridge rectifier diodes on the transformer board, DP43, was short-circuit. A BY179 proved to be a suitable replacement. **G.C.**

Sony KVE2522U (AE1C chassis)

This model has an advanced colour decoder with a digital comb filter inside a screening can at the top of board B1. The set's picture occasionally lost its colour, flickered strongly and pulled sideways at the top. I found that the symptoms could be instigated by gently twisting the top of the decoder board. The cure was to resolder the screening can's five mounting lugs. One of the lower lugs is a vital earth connection.

If this doesn't cure the fault the crystals and trimmer capacitors are suspect. In this model the lower pair are the UK PAL ones. **G.C.**

Ferguson A59F (ICC7 chassis)

This set had suddenly shut down. When the customer had switched it off then on again it worked but the picture had hardly any red content, even when displaying teletext. The tube must have flashed over to the red cathode, because the 1kΩ protection resistor (RT08) in series with it had risen in value to 800kΩ. **G.C.**

Sharp 59CS03H

I share Michael Dranfield's lack of esteem for this chassis (page 156, January). On the other hand we do need some expensive and unreliable sets to keep us going these days! This one came in dead, and a quick inspection revealed the usual dry-joints on the scan-coil PCB and the accompanying items of dead silicon. Willow Vale supplies a chassis kit that contains everything normally required to get one of these sets going. I fitted the kit and was rewarded with HT but not the reassuring rustle of EHT. Oscilloscope checks showed that there was no line drive from the TDA8375A chip IC201. This is a surface-mounted horror the size of a postage stamp, with 64 pins. As far as I can tell it provides no advantages in comparison with the previous generation of more engineer-friendly chips, and you don't get much change out of £40 for it. It was ordered however, prayers were said over it and it was then fitted. Success!

The moral of this tale is: don't get tied to an estimate with this chassis. **S.H.**

NEI NE3743TX (11AK08 chassis)

We recently had in one of these portables – the chassis was covered in the February issue. The set appeared to be stuck in standby, but when I removed the back I saw that it had received previous attention – this had not been mentioned by the customer of course. It didn't take long to establish that the power supply was working but there was no line drive, with Q802 (switched 12V supply) cooking away gently. I fitted a replacement but this made no difference. The TDA8362A jungle chip IC401 had the correct 8V supply at pin 10 but wasn't producing the line drive output at pin 37. Its new appearance led me to believe that it had been recently replaced.

A check with various catalogues revealed that there are numerous non-interchangeable versions of this chip, intended for various different sets. It transpired that someone had fitted the version that costs less than £5. It looks identical to the correct chip, but doesn't work in this chassis. The version required is available to special order from CPC at about £28, and also from Maplin's NEI division at about the same price. This is worth remembering when you provide estimates. I wouldn't be surprised if the previous repairer had greatly underestimated the repair cost and returned the set for that reason.

Fortunately I happened to have a scrap **Bush 1433** that uses the same chassis. The TDA8362A from it restored normal operation. Since then I've had another two of these sets with the same expensive problem. **S.H.**

Sony KVX2172U (AE2B chassis)

I thought this was going to be a straightforward repair: the set was allegedly dead. In fact it would start up but then, after a few seconds, shut down with the sound indicator LEDS flashing. This indicates a deflection problem, which turned out to be dry-joints at the field output chip.

When this had been repaired I checked the set and found that preset location number 3 wasn't tuned to any of the local transmitters. I tried retuning it via the manual tuning menu and noticed that when I dialled in the correct channel number preset number 8 in the tuning list changed to the same setting. As a test I tried the opposite and found that number 8 also tuned number 3. I tried the non-volatile memory initialisation procedure (after noting down the settings) but the fault persisted. So a new memory chip (IC072) was ordered and fitted. This was initialised, then the original settings were stored in it. I missed one however, and this caused an odd problem. The set appeared to work, but the A and B LEDs at the front flashed alternate-

ly then, after about one and half minutes, the set switched to standby and back on again. The cause of this was the feature setting called 'equaliser', which was set to on instead of off. Once this had been reset operation was normal. **D.B.**

Panasonic Alpha 2W chassis

There was no picture though the channel indicator was alight. I found that the chopper chip IC801 wouldn't start up because pin 2 was held low by the standby/on control transistor Q802. This 2SD965R transistor was leaky collector-to-emitter. **D.B.**

B&O LX2500

This set wouldn't start up – it just went back to standby. I tried starting it in the audio-only mode, when there is no line output stage drive, but the result was the same. Checks showed that the HT rose to almost 40V before the set shut down. This is the effect you get when the BU508 line output transistor TR11 is short-circuit. The transistor read OK however. Other checks, on the EW diodes etc., failed to reveal anything amiss. So I started the set in the audio-only mode with the collector of the line output transistor disconnected. It then worked, with the correct HT. But another line output transistor failed to restore normal operation.

A check on the drive to the line output transistor in both modes showed that it was 0·7V DC. So the transistor was being switched on all the time, shorting the HT line. This is one of those chassis that has a transformerless line drive circuit. The cause of the trouble was a dry-joint at one end of the 220Ω resistor R52, which should enable the base of the pnp driver transistor TR15 to go high so that it switches off. TR15 and TR11 were both on all the time. **D.B.**

Sony KV20WS1U (BE5 chassis)

In all display modes except 4:3 aspect ratio there was a blanked part of the picture at or near the bottom of the screen. It consisted of a horizontal bar approximately two inches high. In one zoom mode the picture could be seen appearing again below the blanked section. I discovered that extra blanking was being produced by the small sub-PCB U, which directly blanks the RGB drives to the CRT base PCB. When the preset potentiometer on this PCB was adjusted the blanking bar moved up or down the screen. Checks on the various inputs to this PCB showed that everything was as it should be – line and field pulses, EW signal, vertical ramp, supply and some DC control lines.

As luck would have it we had another of these sets in the workshop. So with great confidence I fitted the U board from the other set in the one on the bench – only to get exactly the same results! The next step was to compare very carefully the inputs to the U board in both sets. They were the same with one exception: in the faulty set pin 1 was at 5V instead of 4·4V. The cause was soon found when the plastic frame had been removed from the bottom of the main PCB in the faulty set. Pin 1 is connected via a 2·2kΩ surface-mounted resistor (R008) to one of the pins of the microcontroller chip IC001. One end of R008 hadn't been soldered. The micro must load down the control line marked HV BLK 1 a little via R008. With R008 disconnected the extra blanking operates when it shouldn't. **D.B.**

Alba CTV841 (Onwa chassis)

The report said that this set "went bang when switched on". It was very similar to the fault with a Goodmans set I mentioned some time back. The small 4·7nF, 500V disc ceramic capacitors C904/5/7 around the mains bridge rectifier tend to go bang – literally! Last time it was C907, which is in parallel with the mains bridge rectifier's reservoir capacitor. This time it was C904, which is across one arm of the bridge rectifier. As usual the 4·7Ω, 5W surge limiting resistor R901 had sacrificed itself to save the fuse, but this time R902 (2·2Ω, 2W) had also blown open. This resistor generates the chopper switch-off ramp which, fortunately, is capacitively coupled to the chopper drive circuit – so the damage gets no farther.

Although the use of non Y or X2 rated capacitors in the C904/5/7 positions is cause for concern, there is one 'benefit'. Failure of these capacitors often brings a set into the workshop just in time to prevent the damage that occurs when the two small electrolytics give up!

The procedure that I find works with these Onwa sets is as follows. Replace as routine C904/5/7 with X1X1 (both specifications together) resin-dipped disc ceramic capacitors – the same type that's used in high-specification monitors. Replace the two 47µF electrolytics in the power supply with 100V, low-ESR types, with 0·47µF, 63V Mylar or polycarbonate capacitors in parallel. These have a much lower ESR than any electrolytic capacitor of any value, and reduce the self-heating in the electrolytic capacitors they protect. If R901 has blown I replace it with an SCK122 negative-temperature coefficient surge-limiting thermistor. This type has a room-temperature resistance of about 12Ω, falling to 3-4Ω at the running temperature. Once these few small modifications have been carried out these sets are no more troublesome than most other economy designs. **I.F.**

Samsung CI3352 (P68 chassis)

The customer complained that this 14in. portable occasionally produced a bright picture with flyback lines. Unfortunately the fault was rather elusive. We soak tested the set for several days then returned it. A few days later the set came back. The fault condition had started to put in more frequent appearances, and lasted long enough for checks to be made.

In the fault condition the first anode supply and the 180V supply to the RGB output stages remained correct, but the voltages at the collectors of the RGB output transistors dropped to about 35V. The 180V supply is fed to the RGB output stage load resistors via choke L901 (330µH). A replacement cleared the fault. **P.G.**

Orion 2093 Combi

This TV/VCR combi unit was dead. With only the end caps of the internal mains fuse still in place there was obviously a short-circuit in the power supply. The cause was quickly traced to the STK73410 chopper chip IC501. I had to obtain a manual to find the values of the two high-wattage safety resistors that had also disappeared. For reference they are R508 1·8Ω, 3W and R506 27Ω, 3W. Both can be obtained from CPC to special order. Once these items had been replaced the unit worked normally. **P.G.**

Philips 28PW632A/05

'Poor picture' was the complaint with this widescreen set. On test I found that there was no green drive at the CRT – the cathode was cut off because of a failure in the green output stage on the base panel. The cause was soon traced to the BF422 transistor T7364. **P.G.**

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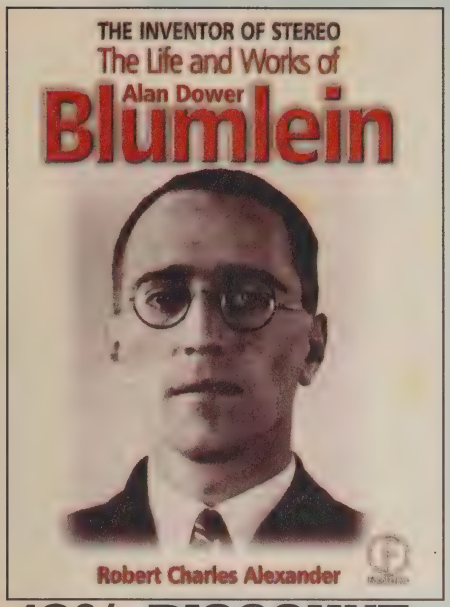

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His 1931 Patent for a Binaural Recording System was so revolutionary that most of his contemporaries regarded it as more than 20 years ahead of its time. Even years after his death, the full magnitude of its detail had not been fully utilized. Among his 128 patents are the principal electronic circuits critical to the development of the world's first electronic television system. During his short working life, Blumlein produced patent after patent breaking entirely new ground in electronic and audio engineering.

During the Second World War, Alan Blumlein was deeply engaged in the very secret work of radar development and contributed enormously to the system eventually to become 'H2S' - blind-bombing radar. Tragically, during an experimental H2S flight in June 1942, the Halifax bomber in which Blumlein and several colleagues were flying, crashed and all aboard were killed. He was just days short of his thirty-ninth birthday.

For many years there have been rumours about a biography of Alan Blumlein, yet none has been forthcoming. This is the world's first study of a man whose achievements should rank among those of the greatest Britain has produced. This book provides detailed knowledge of every one of his patents and the process behind them, while giving an in-depth study of the life and times of this quite extraordinary man.

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Legacy
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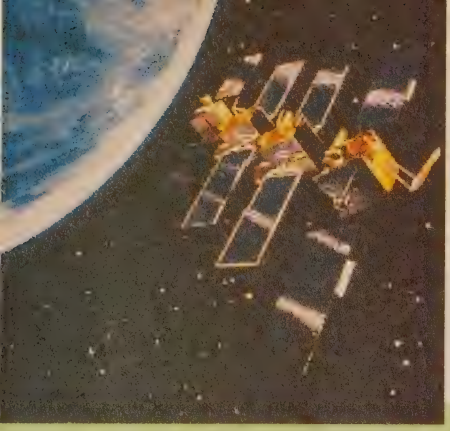

Terrestrial and satellite DX reception. News from abroad and of satellite TV developments. Why 405?, a look at early TV standards. Roger Bunney reports

DX and Satellite Reception

December was a poor month for me personally. First the domestic analogue Astra receiver went 'bang'. Then the Pace DXing dish positioner decided to forget its east-west tracking information. An evening had to be spent finding both the usual and the more elusive satellite positions – the new numbers differed considerably from the original listing! There was local flooding, in which we were trapped, and there were gales on Christmas Eve. Next morning I was on the roof with spanners, clinging to a leaning aerial that threatened to demolish the tile roof. All this plus two versions of flu in two weeks made me feel my age. I was in bed for three days during the start of the new millennium.

Very little DX reception was reported during December. F2 propagation never developed, the MUF over the North Atlantic path rarely reaching 35MHz. Peter Schubert (Rainham, Essex) received Russian communications signals in chs. E2/R1 on the 11th however. Ryn Muntjewerff (Holland) reports that his last F2 reception was on November 24th, when he received ch. E2 signals from the Middle East. But Robert Copeman in Victoria, Australia received ch. E2 signals from Dubai, UAE, his first sighting from this source in nine years! Reception was at 2010-2015 and 2026-2028 GMT. Meteor Shower (Ursids) propagation was reasonably active: over the Christmas period I received signals on several occasions, mainly unidentified ones in chs. E3 and E4. Christmas Eve produced some good visual sightings – between gaps in the rain clouds!

There are reports in *Radcom's* 50MHz column of amateur radio contacts between Romania and Australia on October 31st and of Mediterranean amateurs working New Zealand on November 9th. Unfortunately in the UK we were a little too far to the north for such reception.

Chechnya burns, a report to the UK via the RTV lease.

Satellite Sightings

Good news for analogue zappers: Telstar 12 (launched as Orion 2) at 15°W transmitted a clear NTSC test pattern, 'Welcome to Telstar 12', throughout December at 11·542GHz V. Digital feeds will soon take over however. Eutelsat I F5 at nearby 12·5°W (the 'Atlantic Gate') has been transmitting the Italian cultural channel Digitaly as an analogue signal at 12·516GHz V. The signal is sent from Fucino, Italy to Ontario for N. American cable transmission. A digital version is transmitted at 12·673GHz V, SR 27500, FEC 3/4. More information on Digitaly can be obtained from infotv@digitalychannel.net

Good to see that analogue transmission is alive and well. Indeed on several days throughout December our old analogue friend UKI-149 was uplinking Breakfast Show inserts for Channel 4 via NSS-K (21·5°W).

During the month there was extensive coverage of the Shuttle flight from NASA TV (Johnson Space Centre) via the Reuters NSS-K digital feed at 11·588 GHz V (SR 5632, FEC 3/4). The aim of the mission was to capture and repair the Hubble telescope. Classic footage was seen of the Challenger Shuttle chasing the errant telescope then transferring it to the cargo bay. Once the repairs had been completed, Hubble was returned to space. On one circuit the astronauts provided views of Earth, zooming in on various locations including their own launch pad, with the buildings and road network clearly visible.

For several says over the Christmas period Chaosfilms uplinked material from Paris using the same Reuters feed but with analogue NTSC transmission. The content consisted of various parties and pop groups in and around Paris: it was being fed to VH-1 and MTV. On the 27th I lost the uplink because of rain fade – France was suffering from heavy rain and gales at the time – and had to use threshold extension down to 3·5dB to maintain picture capture with my 1·2m dish. The uplinks were all from 1800 hours onwards.

Overseas TV seemed to take considerable interest in London activities during the approach to the year 2000. Portuguese TV was seen feeding several inserts to Lisbon via a Brightstar hire of the Reuters

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uses an RSD ODM300 digital receiver. He mentions that many of the SIS horse-racing feeds previously transmitted via Sirius at 5°E have gone to either PowerVu or, in the UK, use fibre-optic links. David's interest in satellite reception goes back to the earliest days of Sputnik in the late Fifties, when a warbling doppler-shift tone signal at 11·99MHz was transmitted (and, if I recall correctly, another at around 40MHz?).

The Millennium festivities were a delight to satellite enthusiasts seeking elusive and non-encrypted SISlink feeds. My own reception was restricted by illness. I did however note several feeds from Eutelsat II F3 at 36°E, but they were encrypted and were present for only short periods. I never managed to receive the Shetlands BBC feed, but did receive a couple of NTSC (analogue) feeds via Telecom 2B/D at 5°W: one at 11·513GHz H was to US networks from Paris, the other at 11·689GHz H was to NHK Tokyo. NTSC signals were also seen via Telecom 2C (3°E), one from Paris at 12·643GHz V and another, unusually, of an Egyptian choir in an appropriate setting at 12·600GHz V.

Having previously worked for many years in live TV I fully

Middle East and the North African/Mediterranean areas. Manufacturers such as Sanyo, JVC, Hitachi and Panasonic are producing receivers that incorporate their own aerial. Worldspace plans to target, commercially, South Africa first then Kenya, Ghana, Nigeria, Senegal and the Ivory Coast. A recent demonstration given for the British DX Club at Reading confirmed that excellent-quality reception is possible using a basic commercial receiver placed next to a south-facing window. Worldspace plans to launch additional satellites over the next few years to provide L-band radio services to most other parts of the globe.

Radio Communications: The recently introduced SpeedLAN 10Mbits/sec Wireless Bridge, from the Black Box Company, is indicative of the way in which commercial communications are developing. It provides microwave links between premises separated by distances of up to 16km. With higher-gain aerials, communications over distances up to 40km should be achieved.

The minister of state for small businesses and e-commerce has introduced a new wireless telecommunications service operating at 3·4GHz. It will provide flexible

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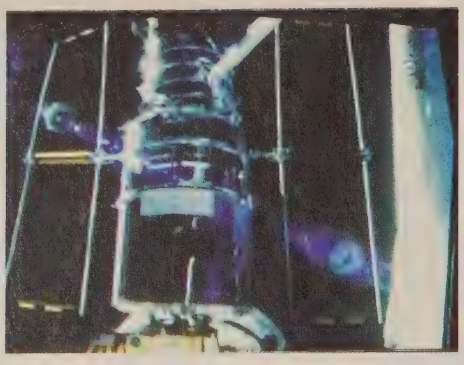

The Hubble telescope being transferred to the Challenger Shuttle's cargo bay for repair. Reception from NASA TV via the NSS-K satellite's Reuters lease.

months. There will be four national digital TV multiplexes, which will occupy channels 66-69 instead of being scattered throughout the UHF band.

Poland: I understand from the BDXC that all the TV transmitters that operated in Bands I and II (chs. R1-5) have closed down.

Ireland: As part of a move to UHF the following Band III transmitters are being phased out: Achill, Fanad, Castlebar, Castletownbere, Letterkenny and Moville.

Sweden: The popular TV4 channel has formed a partnership with subscription channel Canal Plus Nordic. The two will co-operate in programme production, sports services and film making.

Portugal: The national RTP services are not to be sold off despite falling finances. Commercial rival SIC now regularly claims over fifty per cent of viewers, with RTP1 and 2 at under thirty per cent.

The Netherlands: The new Dutch regional station RTV Noord Holland is now in operation on ch. E55, with horizontal polarisation and 200kW ERP. Transmissions are from the PTT tower at Wormer, north of Amsterdam. The PM5544 test pattern is used, with 'RTV Noord Holland' at the top and 'Nozema K55' at the bottom.

Satellite News

Eutelsat and Loral Skynet have reached planning agreement that will avoid interference between the former's satellites at 12·5°W and the latter's Telstar 12 at 15°W.

Interesting comments from Malcolm Campbell, a senior BT business manager. Despite the company's expanded satellite operations with the Paris Teleport in 1998, he feels that fibre-optic cabling will gradually erode the dominance of international satellite links. BT may install fibre-optic cabling between London, Paris and New York. It could offer cost savings, since fibre links are at present more cost-effective than satellite ones. Analogue contracts are a rarity these days in the company's satellite linking business, most of the traffic having gone digital.

A Greek digital programme multiplex, Nova, is to start via Hot Bird (13°E). It will eventually offer some twenty channels, using Irdeto encryption. Cost will be £20 monthly. An alternative Greek digital multiplex, OTE, is also testing via Hot Bird – check at 12·188GHz V. It uses Mediaguard encryption.

The Setanta Irish sports channel is now available, in PowerVu digital form, across Australia via the Optus B3 satellite at 156°E.

Intelsat has provided details of the Y2K precautions it took to ensure that the organisation's seventeen satellite systems, covering 200 countries, didn't crash – particularly the control function that involves Washington and six other monitoring stations around the globe. Some 1,400 items of equipment have been checked during the past three years. The organisation's commitment ends with delivery at a client's site: thereafter Y2K compliance is the responsibility of the client.

Obituary

It is with deep regret that I have to report the death of Bindu Pakadi on October 31st. For many years Bindu sent us reports, initially of his terrestrial DX successes then, after ATS-6 in the mid-Seventies, his satellite activities. He pioneered UHF (714 and 754MHz) reception from the Ekran satellites, despite being remote from the intended target zone (northern Russia/Siberia), and encouraged other enthusiasts to experiment. More recently he was active in band C (4GHz), and had been planning to 'go digital'.

I will miss his letters, which have provided interest and news over the last twenty five or so years. In bidding farewell to an old friend, we extend sympathy to Bindu's family in their sad and unexpected loss.

Of Many Lines and Things . . .

Andrew Emmerson's *405 Alive*, published quarterly, always provides a good read. It's devoted to the old system A transmissions, the technology, the people involved and stories about the services when all was in monochrome with 405 lines. I found an item in issue 43, "Television Line Standards – Why 405 Lines?", particularly interesting.

At the time when the 405-line standard was devised, in the early Thirties, the maximum video bandwidth that could have been handled was about 3MHz. With an aspect ratio of 4:3, the maximum number of lines would have been 450. The pulse generators then used divided the line frequency to obtain the field frequency, which was 50Hz (see below). If you multiply 50 x 3 x 3 x 3 x 3 then 5 you get 20,250. Divide by 2 and you get the 405 line frequency, 10,125Hz. Other multiplications give us 441, which was used on the Continent during the late Thirties, and 625 which of course is still in use.

Andrew comments that the 405-line pictures were very sharp and detailed, with the mono definition better than that seen with 625-line PAL receivers. The latter cover up the lack of detail with LF colour information.

The reason for adopting 50Hz as the field rate (and for the Americans adopting 60Hz) was to standardise with the domestic AC mains supply. In those days DC smoothing was less efficient, and the AC studio lighting could cause bar effects on the received picture. Use of a 50Hz field rate minimised the possibility of this. The principle has been proved in practice. At times when power problems have been severe, for example with load shedding during the miners' strike, TV pictures were often marred by severe hum and ripple effects.

After World War II the UK returned to 405 lines. Most European countries opted for 625 lines. France decided to adopt 819 lines, though the pre-war 441-line system was kept going until the mid Fifties. The Americans had settled on 525 lines in 1941. Subsequently both France and the UK adopted 625 lines. The 405-line system was finally closed in the early weeks of 1985. During the final months there had been a fall in technical standards as ERPs were reduced to maintain transmitter valve life, and there were no more test transmissions. An unfortunate end for the system that led the world into the era of high-definition TV, setting the standard for over fifty years.

My thanks to Andrew for permission to plunder from his article. *405 Alive* is published by *The Radiophile*, Larkhill, Newport Road, Woodseaves, Staffs ST20 0NP. Please include a stamped, addressed envelope should you write to the publishers for details of either of these two excellent publications.

Continued from page 286

Crook, 1 Carice Gardens, Clevedon, N. Somerset BS21 5DY. 01275 879 620.
Wanted: Heads, belts, spares and new tapes for the Philips VCR Model N1700. Phone Steve Rowley at 01889 578 416 or e-mail steve@ljl.co.uk
For sale: As a result of retirement from the trade I have for disposal a large collection of service manuals, many for quite recent models. Also some test gear and spares. Call Keith Evans on 01424 425 810 (Hastings, East Sussex) or visit my web site at: www.sniffout.net/home/jasper/retire.htm
For disposal/wanted: Have the following for sale, an Alcoa 1·8m prime-focus petal dish, polar mount and ground mount, a 24in. pot-type jack new boxed and a 24in. reed-type jack used for one year plus LNBs but no feed horn, £100. Also two Goodmans Magister speaker systems with 15in. bass units at £20 each. For disposal free a Sharp SR550 large hi-fi music centre. Does anyone have a Moto Rumi scooter they want to sell? I used to do service calls on one in the Sixties. David Payne, 01268 696 969 (Essex).
Wanted: *Newnes Radio and Television Servicing* first five volumes published 1955, also the 1955-56, 1956-57, 1959-60 and 1960-61 volumes. Phone Vince Stanley on 01353 862 076 (answerphone).
Wanted: Circuit diagrams for the Ferguson TX80 chassis, the Scopex 4D10A, the EMI scope 101, the TV Universal 37C3, the Sharp Model MC1421, the Amstrad PC8256-8512 and the Grundig 340 audio centre. Also a CD7176-CP chip and a JVC HA1141 chip and a keyboard for the Amstrad PC9512. D. Griggs, 5 Collingwood Avenue, Muswell Hill, London N10 3EH.
Wanted: Service manual (photocopy OK) for the Vega Shiljalis 6in. portable mono TV Model 402D. R.H. Avery, Flat 54, Hereford Court, Hereford Street, Brighton, East Sussex BN2 1LF. 01273 623 409.
Wanted: ZC84328P IC as used in the Ferguson Model 51P7 (TX98 chassis). M.L. Pope, 76 Barkby Thorpe Lane, Thurmaston, Leics LE4 8GS. 01162 602 270. E-mail mps@pope16.freeserve.co.uk
Wanted/for disposal: Require a circuit diagram or service manual for the Armstrong 421 (or 425/426) audio amplifier. Have for disposal a working Sony RM606 RC unit. J.V. Gibson, 4 Cotswold Drive, Garforth, Leeds LS25 2DA.
Wanted: Remote control unit for the Panasonic Model NVHD100 VCR. J.S. Day, Kilirvan Cottage, Southend, Argyll PA28 6PJ. 01586 830 695. E-mail jsd2839@kilirvan.freeserve.co.uk
Wanted: Complete deck for the Hitachi VTF770E (UK) VCR. Leslie Hine, 9 Well Street, Ulverston, Cumbria LA12 7EG. 01229 582 557.
Wanted: Circuit diagrams for the following: Philips 21PT4424/05 (L7.2 chassis); Finlandia 51LZ8/H combined TV/satellite receiver; Cascade CTV510. Also need user instructions for the Philips SBCR430 universal remote control unit. K.G. Cargill, 1 Stradowen Drive, Strathfoyle, Londonderry BT47 6XN. 01504 861 268. E-mail kcargill@lineone.net
Wanted: LOPTs for the Philips G6 chassis, single-standard version, and the Decca CTV25 (dual-standard). Also want any UK dual-standard colour sets, working or non-working, Mike Bennett, 65 Hamilton Lane, Exmouth, Devon EX8 2LW. 01395 274 227. E-mail mdb@permanent.co.uk

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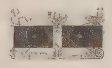

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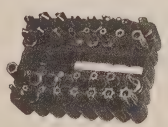

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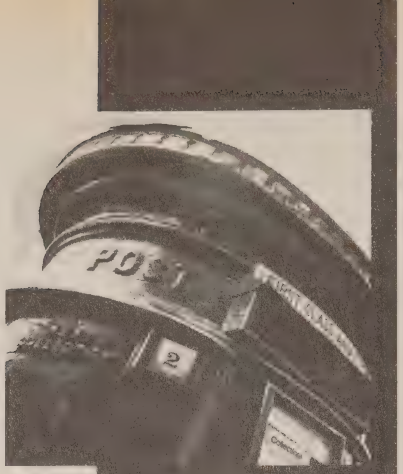

Letters

We welcome letters from our readers and try to publish as many as we can. You can send them typed, handwritten, or on disc. Address them to the Letters Editor, Room L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Call for licensing

There have been calls at various times to regulate and license the consumer electronics servicing trade. It would hopefully banish the cowboys and rip-off merchants, thus providing more work for genuine, qualified engineers while protecting the public against shoddy, dangerous work.

Such regulation and licensing would have to be imposed by the government, which does not seem to be aware of the situation. While talking to my MP, The Right Hon Barry Gardner, recently about another matter I took the opportunity to mention the various problems that service engineers face. He seemed to be very interested in what I told him. I suspect that most of us would like to see some form of licensing, but it has been argued that this would reduce competition and could lead to higher prices (MPs and civil servants don't live in the real world). The following trades/professions are licensed however: gas engineers (Corgi), black-cab drivers, minicab drivers, financial advisers, lawyers, chartered and certified accountants, doctors etc. But anyone can call himself a TV engineer and set himself up in business. I feel that regulation should include the following:

(1) Those who call themselves TV or VCR engineers should be required to show that they are competent to carry out work themselves. They should have the basic necessary test equipment and workshop facilities, or be in the employ of a company that has them. Companies should employ only those who can show they are technically competent.

(2) A company or individual should not be allowed to advertise services unless they can carry them out competently.

(3) There should be a central known and advertised organisation to which engineers belong and to which the public can complain.

In view of the current desperate situation in the trade, I suggest that as many of us as possible should write to our local MPs. It might help to make the point by enclosing copies of any relevant back-up material such as letters and articles in *Television*. The more of us who write in or go to see their MPs, the greater the chance that something will be done.

A campaign could be started by interesting the local and national press and getting organisations such as RETRA to make representations.

If you do write and receive a reply, it would be helpful to send a copy of such correspondence to me via *Television* so that the situation could, in a few months time, be reviewed.

Some MPs will take notice, especially if you badger them. You can write to your MP at The House of Commons, Westminster SW1.

Michael Maurice,
Wembley, Middx.

PS: I am at present looking into another matter, "theft of service", and will be commenting on this in a further letter.

Baird

I feel that Alastair Carruthers' article A Century of TV (January) was extremely thin on J.L. Baird and his achievements. In 1938 Baird's company was selling the Model T14 receiver which had a 15in. CRT. At the same time 22in. tubes were sold to the BBC for monitor use. These were the largest tubes available for their markets at the time. In 1935, using an improved Farnsworth Image Dissector, Baird successfully demonstrated 700-line images and pointed out that the allocated TV bandwidth could not carry this video rate; indeed even 405 lines needed more than this to be transmitted correctly – the reason why observers could see no difference between Baird's 240-line and EMI-Marconi's 405-line pictures in 1936-7.

By 1945 Lord Hankey's TV Committee, in a white paper that endorsed Baird's World War II research, suggested 1,000 lines and 3D. We still don't have it! The date of the world's first electronic colour receiver, the Telechrome with 600 lines, is August 1944 not 1940 as stated. By 1946 Baird was selling the Grosvenor receiver with 27in. CRT, the largest in the world.

From 1947 Baird's company Cintel started selling to the BBC CRT flying-spot units to replay from cine film. At the present moment Cintel dominates this market worldwide, with factories in 67 countries.

Baird can be justifiably proud of his immense achievements. My two books *The Secret Life of J.L. Baird* (Century-Hutchinson) 1986 and *Vision Warrior* (Orkney Press) 1990 are essential reading.

Dr Peter Waddell, Senior Lecturer, University of Strathclyde, Glasgow.

Alastair Carruthers writes: As the editor specified a strict limit to the length of my article there was much that had to be left out. My apologies for misspelling the name of Baird's colour tube, Telechome instead of Telechrome, and for referring to it as a camera tube. The initial version was a two-colour device, with blue-green and orange-red phosphors coated on opposite sides of a translucent screen within a bulb and electron guns at each side. The huge thing would hardly have been practical for domestic use. Baird took out a patent for the idea in 1940 and demonstrated the tube in 1944. He seems to have

done quite a lot of work on tubes once he appreciated that mechanical TV was not viable. The pre-war Baird sets, including the T14, were made by Bush Radio. Bush and Baird Television were then controlled by the Ostrer brothers, Baird having gone his own way to concentrate on research. The Hankey Television Committee recommended the resumption of 405-line transmissions, with a possible future change to 1,000 lines. Baird died on June 14th, 1946. He had indeed been a great innovator, taking out 150 patents between 1923-1945.

Estimates and quotations

Paul Smith's article on estimates and quotations (February) was great as far as it went, but there can be problems. For example, a Matsui colour portable was recently brought to me for repair. The owner had refused an estimate of £80 from another outfit that was presumably more interested in selling a replacement set. I traced the cause of the fault to a 390kΩ resistor in the start-up circuit. It's a common enough occurrence, one we all get time to time.

Now, how would Paul charge for this? If he was to say labour £30, parts 10p, I'm sure that many customers would never believe it or think they were being ripped off by being charged £30 to fit a 10p component. I can just hear the customer, can't you? No, much better to say "I can fix it for £30.10 including parts and labour". Good, eh?! You've got your money, and the customer goes away singing your praises – "what a nice man, and so reasonable".

The beauty of this approach is that if the customers are nice folks but not very well off you can adjust the price down a bit. If they get up your nose you can bump it up a bit. At least that's what I tend to do.

Best of luck, fellow repairers – and don't let them get you down!
Mike Haywood,
MHTV, Falmouth.

Ferguson ICC5 chassis

In the September issue (page 793) M.J. Bennett mentioned line output transistor failure with this chassis, the line output stage heatsink getting hot where it's in close proximity to the chopper transformer. I've had the same problem with this chassis. The transformer produced a heating effect in the area of heatsink close to its ferrite outer core.

Both outer limbs have an air gap that produces magnetic leakage which affects any metal close by. The result was unexpected failures of the S2000AF line output transistor. This was strange, as the set had been in this state since new (1994) and had not initially caused problems. But I had previously replaced the original 2SD1546 transistor with an S2000AF. Maybe the original type is more tolerant of high temperatures.

On the latest occasion I was tempted to try a belly band as suggested, but opted for a simpler idea – bending the corner of the heatsink away from the chopper transformer. This can be done because of the metal gauge used and the fact that there are no components in this area. The result has been a complete success, with the heatsink now at normal temperature.

I hope this helps anyone with a similar problem.
R.F. Weston,
Rubery, Birmingham.

Not Even a Chance

I would like to sympathise with M.R. Chambers (Letters December). In 1996 I returned to the UK after working for five years in Australia. Being just over 50 years old, I took quite a gamble coming back with no job. The day after I returned however there was an advertisement in the local paper for field technicians at Mastercare. My spirits were lifted when, on phoning, I was given an interview the following day. At the interview I received very similar treatment to M.R. Chambers. The local service manager told me that as far as he was concerned I was just the person he was looking for and the job was mine if I wanted it. But the final decision was not his: I would have to through a psychoanalytic test which, according to him, would be no problem. I had been in the trade all my working life, five years as a trainee then the rest of it, apart from ten years as a service manager with a national rental company, as a field service technician. I had also spent three months working in London dealing with customer complaints, which had got out of hand with a company that had been taken over.

At the end of this, to quote M.R. Chambers, "soul destroying and totally humiliating" test I was told I was not the type of person they were looking for. It makes one wonder what type of person Mastercare does employ!

Fortunately a colleague I had worked with in the late Sixties came up with a job offer, and I was taken on as a field technician with a company car.
Peter F. Exeter,
Dereham, Norfolk.

I read with interest the letter from M.R. Chambers in the December issue, having a similar story which unfortunately ended a thirty-year career with Mastercare. My job as a service engineer based at Bedford came to an end when I was subjected to the same humiliating psychoanalytic abuse. The regime operated by the local area manager puts a terrible strain on employees. This, combined with his management style, forced me to take early retirement on the grounds of depression caused by work-related stress. It seems to me that M.R. Chambers was probably fortunate not to get the job.
M.R. Mulliss,
Wyboston, Bedfordshire.

I read the letter from M.R. Chambers (December) with sadness – that an obviously motivated young man had been stopped from building a career as a TV engineer by a company which should know better than most that there is a definite and worrying shortage of young people coming into the servicing field. In all sectors sixty per cent of the service engineers are now in their fifties, and of those to whom I have spoken many would like to take early retirement while most of the rest would like to do something else.

The pressure on this gallant band of chaps and chapesses is enormous. While most customers are a pleasure to deal with, a proportion are disagreeable, bad mannered and demand immediate service. Unfortunately companies that expect loyalty, trust and respect together with high productivity at all times do not return these qualities and, as M.R. Chambers has no doubt discovered, pay very little.

M.R. Chambers and others like him will however have the last laugh. In about ten years time the shortage of engineers will be so acute that it will probably be possible to pick your employer rather than vice versa. I have also found that companies which rely on psychology tests for employee selection nearly always have a weak management structure (they cannot make decisions unaided): because the middle managers are chosen by psychologists, most have probably

been promoted beyond their ability, but no one is going to admit to such a mistake.

Change is on the way however. This consumer society will want its 32in. screens, surround sound and digital whatever *all* the time. So TV service engineers will be calling the shots in the not too distant future. Stick at it Mr Chambers: there are other companies (and countries) that will value your expertise in the years to come.
Caroline Evans,
Fraserburgh, Aberdeenshire.

ASC Status

I have made many requests to manufacturers to obtain ASC (authorised service centre) status but always receive the reply that my area of Gloucestershire is already covered. If any manufacturer has an opportunity for a fully-qualified and experienced engineer with a fully-equipped workshop and a good, sound base of existing private customers to become as ASC in this area, would they please contact us.

I would also be interested in hearing from any regular readers who can offer advice or comments on this issue.
Robert Ingleby,
Professional Electronic Services,
25 Pyart Court, Coleford,
Gloucestershire GL16 8RG.
Phone 01594 837 364 or e-mail
pro.elec.serv@LineOne.net

Work

Could I add another two pennyworth to the debate on where the trade is going? Geoff Darby says (letters January) that he didn't attend college for five years to end up repairing vacuum cleaners. But to make a living we must be prepared to take on anything. Right now I have more than enough TV work to make a fair living. If asked however I will gladly repair vacuum cleaners or virtually anything else. Just remember: for half an hour to strip a machine, blow out the crud with an airline, lubricate the bearings, maybe fit a new belt and brushes and reassemble you can charge £15 plus parts, saving the grateful customer the £100 cost of a new one. And all with no brain strain!

A customer recently asked me to look at a freezer. It was dead with a foul smell that came from the back. This smell came from the connector on the compressor. I discovered that it contained a posistor – a larger version of the type familiar to us TV engineers. It had, just as they do in TV sets, blown itself to bits and burnt up the connector. A replacement connector cost £13 complete. This was charged to the customer at £20 plus £20 call out. Result: a profit of £27 for less than an hour away from base, and a very happy customer who had been told that the freezer was, at eight years old, uneconomic to repair and would have to be replaced at a potential cost of well over £200.

I also do electrical and plumbing work – even unblock drains if asked to – although I don't advertise the fact.

The point is that there is plenty of work available. If you are versatile and charge reasonable prices, you *will* make a good living.

On the subject of spares prices, I recently received a leaflet from Willow Vale offering a Sharp VCM302 VCR for £71.49 plus VAT. As a matter of interest, knowing that these machines have an integrated head drum/motor, I looked up the cost of this item. It's £53.18 plus VAT. I already have several Sharp VCRs that have been scrapped because of the need to replace this unit – some are less than two years old. I wouldn't want to sell a customer a product that could be unrepairable in under two years, and make this clear to customers who seem reluctant to have older VCRs serviced. As Martin Pickering points out (letters January), with the right sales pitch we can save some far better machinery from the scrap heap. This also helps the environment – after all, every scrap machine eventually ends up in a hole in the ground.
Colin J. Guy,
Boston, Lincs.

ESR Checks

In his Satellite Workshop column in the November 1999 issue Jack Armstrong mentioned a fault with a Pace Model MSS300. The unit was dead with the chopper transistor short-circuit and the surge-limiter resistor and mains fuse open-circuit. When checked with an ESR meter C59/60/61 produced no readings. Without question they were the cause of the failures. This problem occurs only when the mains supply is disconnected then restored.

Jack also found that the mains rectifier's reservoir capacitor, when checked, had the correct value (47μF) but produced an ESR reading of 5Ω. He was right to replace it. This capacitor (C54) should produce an ESR reading of 2·5Ω or less. Its replacement avoided a call back. Within months C54 would have been effectively open-circuit and the power supply would again have blown up.

For effective repair of an analogue satellite receiver the appropriate Relkit should be fitted. These are available from SatCure (01270 355 411).
Alan Willcox,
Cardiff.

Stranger than Fiction?

I have a widescreen Sony Model KV28WS1U. Because of its uncertain construction – the PCBs tend to dance in time with the music – it requires regular attention. This consists of lowering it, face down, on to the carpet, removing the boards and cleaning the contacts.

My last effort was somewhat different. The set slipped and landed heavily on the carpet and my toe. I retreated from the room in hast, expecting an implosion, then gingerly returned. When I switched the set on I was rewarded with a remarkably good picture. After completing my maintenance job the result was the same. My wife then came into the room and remarked on how good the picture was.

I appreciate that what is a 'good picture' is a subjective matter, but I really do believe that there has been an improvement. Have I discovered a previously unreported renovation technique? I assure you that this is all absolutely true.
G.D. Adams,
Ringstead, Northants.

Interference

A recent move to a new location caused a couple of problems. I now have a low-pressure sodium light just outside: as it warms up, a line runs down the TV screen. Then, as I was watching, the colour went, the picture broke up and the sound became funny. This happened only with BBC-2 and Ch. 4. After investigating various interference possibilities I discovered, quite by chance, that the wiring to my room light was burnt through at the lampholder. It must have been arcing away. Rewiring cured that, but I still have the street-light problem.

Another thing is that the electricity supply seems to be far less well regulated than it should be, varying between 270V at the highest and 245V at the lowest. I suppose most people don't bother about the line voltage unless lamps start popping.
Ian Johnson,
Kidderminster.

Answer to Test Case 447

– see page 281 –

What a catalogue of complaints! Yet the widescreen JVC set was not in any way faulty. These modern large-screen receivers have lots of settings stored in software. Some are available to the user, with the help of the operating instructions and a series of on-screen menus. Others have to be set by a technician and are described only in the workshop service manual. Sometimes, though not in this case, the technician adjustments can be carried out only by using a special remote-control handset.

Problem number one was easily resolved by use of the auto-tuning feature. There's provision to display a blue screen instead of snow with a weak or no signal. Similarly the lack of audio outputs from the rear sockets was because they had been switched off via the features menu.

The third problem, absence of colour with VCR playback via the scart connection, was caused by the fact that the EXT mode had been set to S-VHS, perhaps because the previous owner had a posh high-band VCR.

The contrast change with different ambient light levels is a feature of the JVC set's ECO mode. Once again it can, if required, be switched off via the features menu.

Ability to deal with software settings has become a vital aspect of TV servicing.

NEXT MONTH IN TELEVISION

Spares Guide 2000

Latest updated version of the *Television* spares guide

Servicing dumb terminals

A dumb terminal is one of a number linked to a mainframe computer. Many are now elderly and beginning to fail. This offers opportunities for profitable servicing, as companies are usually pleased to have them repaired. Ian Rees investigates this field, dealing specifically with the Wyse WY120 which was distributed by ICL and other manufacturers. The article nevertheless serves as a general introductory guide to servicing this type of product.

An auto scart changeover circuit

This circuit was devised by Michael Dranfield to enable the outputs from two security cameras with scart outputs to be recorded alternately. It uses a 555 timer chip and fits into a two-way scart splitter box.

Modern cable TV networks

The use of optical transmission in CATV networks has vastly increased capacity. Recent developments such as wavelength division multiplexing can substantially multiply the services that can be carried by one fibre.
J. LeJeune investigates this technology.

All about film capacitors

Plastic film capacitors, e.g. polyester, are probably the type most widely used in electronics. Ray Porter describes their construction, characteristics and failure conditions.

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Version 8 of the computerised Index to TELEVISION magazine covers Volumes 38 to 49 (1988-1999). It has thousands of references to TV, VCR, CD, satellite and monitor fault reports and articles, with synopses. A TV/VCR spares guide, an advertisers list and a directory of trade and professional organisations are included. The software is quick and easy to use, and runs on any PC with Microsoft Windows or MS-DOS. Price is £36 (supplied on a 3.5" HD disc). Those with previous versions can obtain an upgraded version for £16. Please quote the serial number of the original disc. See the CD-ROM offer below.

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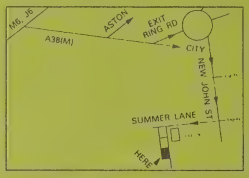

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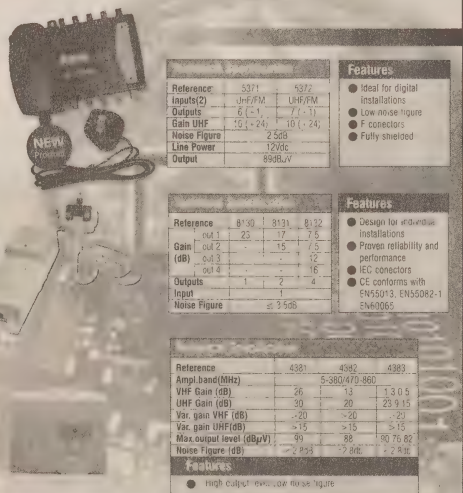

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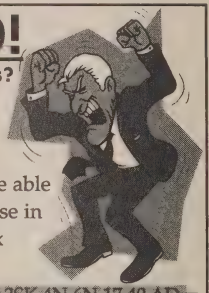

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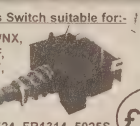

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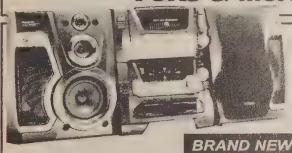

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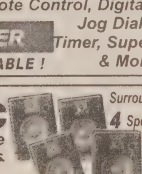

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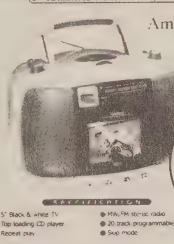

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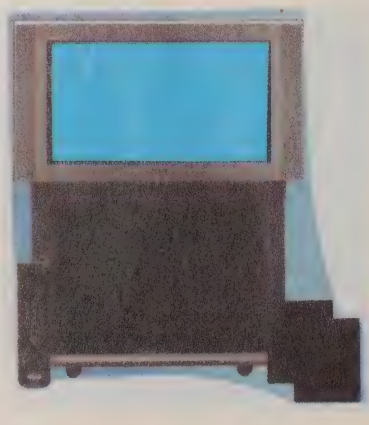

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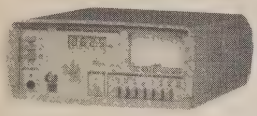

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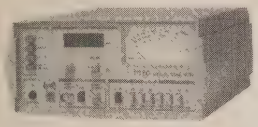

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TLF1457B, TLF701/6

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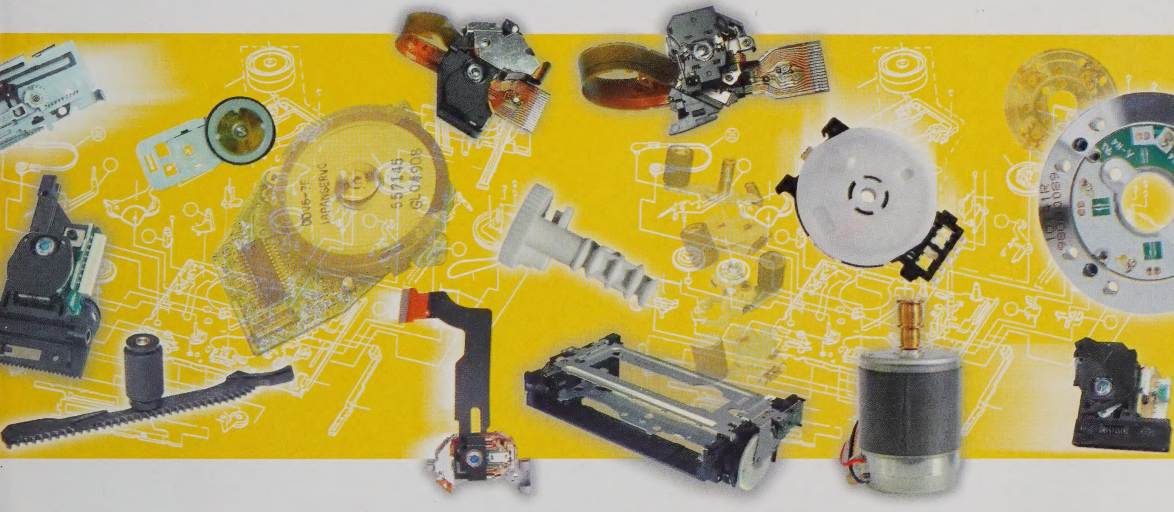

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